Department: Artificial Intelligence and Machine Learning

Vision of the Department

"To produce technically competent graduates in the field of Artificial Intelligence exhibiting etiquette and amenable for significant contributions to the society".

Mission of the Department

- To develop technical and professional skills to meet the industrial and societal needs
- To promote research culture among students enabling continuous learning.
- To inculcate ethical values and good leadership qualities.

Program Educational Objectives (PEOs)

- Develop intellectual software solutions by continuous learning and contribute to his/her career as an outstanding employee/entrepreneur.
- To keep running knowledge of advances in the field of intelligent technology and uphold research.
- Use Artificial Intelligence and Machine Learning models on data to develop software applications in emerging areas for better decision making.
- Acquire leadership qualities to work in team, contributing to the betterment of the humanity and society.

Program Outcomes (POs)

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)
Academic year 2023-2024

Scheme of Teaching and Examination-2022 (160 Credits Scheme, NEP)

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2022-23)

III Semester B.E **Academic year: 2023-24**

Sl No	Course Code		Course Title	Teaching Dept.	L	T	P	Credits	CIE Marks	SEE Marks	Total Marks	Exam Hours
1	BS	22SS301	Statistics and Probability	MA	3	-	-	3	50	50	100	3
2	PC	22AM302	Data Structures and its applications	AM	3	-	-	3	50	50	100	3
3	PC	22AM303	Operating System	AM	3	-	2	4	50	50	100	3
4	PC	22AM304	Introduction to Machine Learning	AM	3	-	2	4	50	50	100	3
5	PC	22AM305	Object Oriented Programming	AM	3	-	-	3	50	50	100	3
6	PC	22AM306	AM Department Skill Lab-1	AM	-	-	4	2	50	50	100	3
7	HS	22HV307	Universal Human Values	HS	2	-	-	1	50	-	50	-
8	HS	22ES308	Environmental studies	HS	2	-	-	1	50	-	50	-
L: Lecture, T-Tutorial, P-Practical/Drawing, CIE: Continuous Internal Evaluation, SEE: Semester End Examination				**Total**	**19**	**-**	**8**	**21**	**400**	**300**	**700**	-
Credits Distribution: Basic Science (BS)= 08+08+3 = 19, Engineering Science (ES) = 10+11=21, Humanities & Social Sciences (HS) = 1+2=03, Program Core (PC) = 02+16 = 18, Total Credits=20+20+21 = 61.												

Department:Artificial Intelligence and Machine Learning			**Semester:**	**3**
Subject: Statistics and Probability				
Subject Code:	**22SS301**		**L – T – P - C:**	**3-0-0-3**

Sl. No	Course Objectives
1	Introduce the concept of correlation and regression and fitting of a curve.
2	Apply discrete and continuous probability distributions for single and two variables in analyzing the probability models arising in engineering field.
3	To understand the concepts of the stochastic process of a statistic and estimation of parameters.
4	Develop analytical capability and to impart knowledge of Probability, Statistics and Queuing.

Unit	Description	Hrs
I	**Statistical Methods:** Correlation and regression- Karl Pearson's coefficient of Correlation,Regression analysis- lines of regression (without proof), rank correlation, problems.**Curve fitting:** Curve fitting by the method of least squares- Fitting of the straight line, second degree parabola and exponential form of the curve $y = ab^x$ (All results without proof) –Problems.	**08**
II	**Probability Distributions:** Review of basic probability theory**.** Random variables (Discrete and Continuous), Probability of mass/density functions, Binomial distribution, Poisson's distribution, Exponential distribution and Normal distribution (without derivations) and problems.	**08**
III	**Joint probability distributions**: Joint probability distribution for discrete random variables, Mathematical expectations, Covariance and Correlation. **Analysis of variance:** Definition and properties, one way classification, verification within and between treatments.	**08**
IV	**Markov Chain:** Probability Vector, Stochastic Matrix, Regular Stochastic Matrix, definition of Markov Chain, Transition Probabilities and Transition probability Matrix, Higher Transition Probabilities, state transition diagram, stationary distribution of regular Markov chains, problems. **Queuing theory**: Introduction, Concepts and M/G/1 and M/M/1 queuing systems, problems.	**08**
V	**Sampling and Statistical Inference:** Sampling distributions, Concepts of hypothesis, standard error and confidence interval, Type-1 and Type-2 errors, Level of significance, One tailed and two tailed tests. Z-test: for single mean, for single proportion. Student's t – distribution, Chi-square test for goodness of fit.	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Understand the concepts of Curve Fitting, Correlation, Regression, probability distribution and Markov chain.
CO2	Formulate and solve mathematical problems on probability distribution, sampling theory and queuing theory.
CO3	Analyze the behavior of Markov chain-based problems in the long run and compute the correlation, covariance of random variables using joint PDF concept.
CO4	Apply the concepts of Analysis variance, testing of hypothesis and queuing models in engineering fields.

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3	2												
CO3	3	1												
CO4	3	2												

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Higher Engineering Mathematics	B.S.Grewal	43rd Edition, KhannaPublications,2015. ISBN:9788174091956
2	Introduction to Probability Models	Sheldon M. Ross	Elsevier, 9th Edition, 2007

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Probability, Random Variables and Stochastic Process	Athanosios Papoulis & S. UnnikrishnaPillai	Tata McGraw Hill, 4th Edition, 2002.
2	Higher Engineering Mathematics	B.V.Ramana	1st Edition, TataMcGrawHill,2006.ISBN:9780070634190

Department: Artificial Intelligence and Machine Learning			**Semester:**	**3**
Subject: Data Structures and its Applications				
Subject Code:	**22AM302**		**L – T – P - C:**	**3–0–0–3**

Sl. No	Course Objectives
1	To provide the knowledge of basic data structures and their implementations.
2	Define and Analyse the concepts of Linear & Non-Linear Data Structures.
3	To understand importance of data structures in context of writing efficient programs.
4	To develop skills to apply appropriate data structures in solving real world problems.

Unit	Description	Hrs
I	**Pointers and Structures revisited, Stacks and its applications:** **Pointers and Structures revisited:** accessing variables through pointers, passing pointers to a function, pointers to pointers, array of pointer, pointers to functions, memory allocation functions,. Structure definition and declaration, Types of structures. **Stacks:** Definition and Examples, Representing Stacks in C. Example: infix, postfix and prefix: basic definitions and examples, evaluating a postfix expression with program, converting an expression from infix to postfix with program. Recursion: binary search and towers of Hanoi.	**08**
II	**Queue, Circular queue and Priority queue:** Queues: The Queue and its Sequential Representation, C implementation of Queue. Circular Queue, and The priority queue – Array implementation of priority queue.	**08**
III	**Singly Linked List, Circular Singly Linked List:** Inserting and removing nodes from a list, Header nodes, Array implementation of lists, limitations of array implementation. Linked implementation of Stack, linked implementation of queue.Circular lists: primitive operations on circular list.	**08**
IV	**Doubly linked list, Circular Doubly linked list:** Doubly linked lists: Inserting and removing nodes from a double linked list. primitive operations on circular doubly linked list.	**08**
V	**Trees: Basic tree concepts:** Terminology, tree representation, Binary trees: properties, binary tree structure. Binary tree traversals: Tree traversal techniques: preorder, inorder and postorder, Expression trees: infix, postfix and prefix traversal. General trees: Changing general tree to binary tree, insertion into general trees.	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Interpret the basic concepts of data structures and their operations.
CO2	Explicate the working principle of linear and non-linear data structures.
CO3	Evolve a code snippet for the implementation of data structure for an application development.
CO4	Distinguish and Involve concepts of linear and non-linear data structures to solve a problem.

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1												
CO2	2	3	2	3										
CO3		2	3	2										
CO4		2	3	2		2					1			

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Data Structures: A Pseudocode Approach with C	Richard F. Gilberg and Behrouz A. Forouzan	Second Edition, Cengage publication, 2007, ISBN- 13: 9788131503140
2	Data Structure using C	Aaron M. Tenenbaum, YedidyahLangsam and Moshe	Data Structure using C

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Data Structures and Program Design in C	Robert Kruse, C L Tondo, Bruce Leung, ShashiMogalla	PHI, 2nd Edition, 2015,ISBN-13: 978- 0132883665.
2	Data Structures	Seymour Lipschutz	McGraw Hill publications, 2018, ISBN-13:978-0-070198-4

Department: Artificial Intelligence and Machine Learning	**Semester:**	**3**

Subject: Operating System				
Subject Code:	**22AM303**		**L – T – P - C:**	**3 – 0 – 2 – 4**

Sl. No	Course Objectives
1	To learn the classes of operating system, design architecture and system calls.
2	To understand the concepts of process synchronization and scheduling through various algorithms.
3	To gain knowledge on system concepts that includes Mutual exclusion algorithms and deadlock detection algorithms.
4	To learn the mechanisms involved in resource management in an OS.

Unit	Description	Hrs
I	**Introduction to Operating Systems and System Structures**: What operating systems do? Computer System architecture **System Structures** : Operating System Services, System calls; Types of system calls; Operating System structure.	**08**
II	**Process Management**: Process concept: Overview; Process scheduling; Operations on processes; Inter process communication. **Multithreaded Programming**: Overview: Motivation, Benefits; Multithreading models;**CPU Scheduling**: Basic concepts; Scheduling criteria; Scheduling algorithms: First Come, First Served Scheduling, Shortest-Job First Scheduling, Priority Scheduling, Round Robin Scheduling.	**08**
III	**Process Synchronization**: Background; The Critical section problem; Peterson's solution; Mutex Locks; Semaphores; Classical problems of synchronization. **Deadlocks:** System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection; Recovery from deadlock.	**08**
IV	**Memory Management**: Memory Management Strategies: Background; Swapping Contiguous memory allocation; Paging; Structure of page table; Segmentation. **Virtual Memory Management**: Background; Demand paging; Copy- on write; Page replacement; Allocation of frames; Thrashing.	**08**
V	**Storage Management**: File System: File concept; Access methods; File system mounting. Implementing File Systems: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. **Mass storage structures**; Disk structure ; Disk attachment; Disk scheduling; Disk management.	**08**

LAB CONTENT

Sl. No	Experiment Description
1	**a.** Write a program using fork () system call that creates a child process. The child process prints its own pid, id of its parent, does directory listing (using exec () system call) and exits. The parent process has to invoke wait () system call to wait for child process to complete and prints its own pid and id of its child process and then exists. **b.** Write a program to demonstrate the basic Pthreads API for constructing a multithreaded program that calculates the summation of a non-negative integer in a separate thread.
2	Develop two programs (server and client) that illustrate the passing of a string via shared memory between the processes running simultaneously. The server program creates the shared memory portion and string. The client program attaches itself to the created shared memory portion and uses the string.
3	Design, develop and execute a program to simulate the working of Shortest Job First scheduling algorithm. Compute and print the average waiting time and average turnaround time. Draw the Gantt chart, calculate the average waiting time and average turnaround time manually and compare the results.
4	Design, develop and execute a program to simulate the working of Round Robin Scheduling algorithm with different Quantum sizes. Compute and print the average waiting time and average turnaround time. Draw the Gantt chart, calculate the average waiting time and average turnaround time manually and compare the results.
5	Implement the Producer-Consumer problem with bounded buffer using semaphores.
6	Design, develop and run a program to implement the Banker's Algorithm. Demonstrate its working with different data values.
7	Implement Best fit Memory management scheme.
8	Implement LRU Page Replacement Algorithm.
9	Implement Disk Scheduling Algorithms like: FCFS, SSTF, and SCAN.
10	Implement file allocation on free disk space in a contiguous manner.

Course Outcomes:

Course outcome	Descriptions
CO1	Explore the fundamental concepts of various operating system services.
CO2	Describe various process management techniques to solve problems in multi-process environment.
CO3	Select and apply suitable techniques for efficient management of system resources
CO4	Analyze the performance of various resource management technique

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3						2		2		
CO2	3	3	2	3								2		
CO3	3	3	3	3								2		
CO4	2	2	2	2								2		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Operating System Principles	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	9th edition, Wiley-India, 2016. ISBN: 978-1-118—06333-0

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Operating systems	D.M Dhamdhere	3rd Edition, Tata McGraw Hill, 2017 ISBN:9781259005589
2	An Introduction to Operating Systems: Concepts and Practice	P.C.P. Bhatt	4th Edition,PHI (EEE), 2013. ISBN: 9788120348363

Department: Artificial Intelligence and Machine Learning	**Semester:**	**3**

Subject: Introduction to Machine Learning				
Subject Code:	**22AM304**		**L – T – P - C:**	**3 – 0 – 2 – 4**

Sl. No	Course Objectives
1	To Explain Machine Learning and its applications.
2	To Describe a variety of learning paradigms, algorithm's theoretical results, and applications.
3	To study the basics of supervised and unsupervised learning.
4	To Illustrate ML algorithm and their use in appropriate applications.

Unit	Description	Hrs
I	**Introduction to Machine Learning** : What Is Machine Learning, What Problems Will Machine Learning Be Solving, Types of Machine Learning Algorithms, **Extending Python Using NumPy**: What Is NumPy? Creating NumPyArrays , Array Indexing, **Manipulating Tabular Data Using Pandas** : What Is Pandas? Pandas Series, Pandas DataFrame, Creating a DataFrame ,Specifying the Index in a DataFrame, **Data Visualization Using matplotlib**: What Is matplotlib? Plotting Charts, Getting Started with Scikit-learn for Machine Learning: Introduction to Scikit-learn Getting Datasets.	**08**
II	**Supervised Learning—Linear Regression**: Types of Linear Regression, Linear Regression ,Using the Boston Dataset , Data Cleansing ,Feature Selection , Multiple Regression , Training the Model , Getting the Intercept and Coefficients , Plotting the 3D Hyperplane , Polynomial Regression , Formula for Polynomial Regression , Polynomial Regression in Scikit-learn , Understanding Bias and Variance.	**08**
III	**Supervised Learning—Classification Using K-Nearest Neighbors (KNN)**: What Is K-Nearest Neighbors, Implementing KNN in Python , Plotting the Points , Calculating the Distance Between the Points , Implementing KNN , Making Predictions , Visualizing Different Values of K , Using Scikit-Learn's K Neighbors Classifier Class for KNN, Exploring Different Values of K , Cross-Validation , Parameter-Tuning K , Finding the Optimal K.	**08**
IV	**Unsupervised Learning—Clustering Using K-Means**: What Is Unsupervised Learning, Unsupervised Learning Using K-Means, How Clustering in K-Means Works ,Implementing K-Means in Python, Using K-Means in Scikit-learn , Importing the Data , Cleaning the Data , Plotting the Scatter Plot, Clustering Using K-Means , Finding the Optimal Size Classes.	**08**
V	**Performance Evaluation:** Basic Performance Criteria, Precision and Recall, Other Ways to Measure Performance, Learning Curves and Computational Costs, Methodologies of Experimental Evaluation.	**08**

LAB CONTENT

Sl. No	Experiment Description
1	Introduction to Advanced Python programming concepts and Jupiter Notebook
2	Implement sample programs using NUMPY.
3	Implement sample programs using PANDAS.
4	Implement sample programs using matplotlib.
5	Implement sample programs with Scikit-learn.
6	Write a Python program to extract social_network_ads.csv file. Apply k-Nearest Neighbor technique to identify the users who purchased the item or not.
7	Consider a dataset that has two variables: salary (dependent variable) and experience (Independent variable). Build a simple Linear-Regression model in Python to do the following: • Find out if there is any correlation between these two variables. • Find the best fit line for the dataset. Show how the dependent variable is changing by changing the independent variable.
8	Consider a Mall Customers data set which is the data of customers who visit the mall and spend there. In the given dataset, we have Customer Id, Gender, Age, Annual Income ($), and Spending Score (which is the calculated value of how much a customer has spent in the mall, the more the value, the more he has spent). From this dataset, calculate some patterns using k-Means clustering method.

Course Outcomes:

Course outcome	Descriptions
CO1	Describe various supervised and unsupervised machine learning algorithms
CO2	Illustrate the working of Machine Learning Algorithms.
CO3	Compare and analyze the performance of classifiers.
CO4	Apply variety of machine learning algorithms on datasets.

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2											
CO2	3	2	2	2	2									
CO3		2												
CO4	2	2	3	1	3									

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Python Machine Learning	Wei-MengLee	WILEY Publications, 2019, ISBN: 978-1-119-54563-7ISBN: 978-1-119-54569-9 (ebk)
2	An Introduction to Machine Learning	Miroslav Kubat	2nd Edition,Springer, ISBN: 978-3-319-63913-0 ISBN:978-3-319-63912-3

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Machine Learning	Tom M.Mitchell	India Edition 2013, McGrawHill Education, ISBN:13:9780070428072
2	Machine Learning–An Algorithmic Perspective	Stephen Marslan D	2nd Edition,Chapman and Hall/CRC,2014, ISBN-10:1466583282 ISBN-13:978-146583283

Department: Artificial Intelligence and Machine Learning			Semester:	3
Subject: Object Oriented Programming				
Subject Code:	22AM305		L – T – P - C:	3–0–0–3

Sl. No	Course Objectives
1	Understand the fundamentals of object-oriented programming in Java, including defining classes, Objects, invoking methods
2	Understand the principles of inheritance, packages and interfaces.
3	Understand generic programming and implement generic classes and methods.
4	Design and develop reliable Object oriented programs.

Unit	Description	Hrs
I	**Fundamentals of Object Oriented Programming**-Introduction, Object oriented Paradigm, Basic Concepts of OOP, Benefits of OOP and Applications of OOP. Java Environment, Simple Java Program, An Application with Two Classes, Java Program Structure, Implementing a Java Program, Java Virtual Machine, Command Line Arguments.	**08**
II	**Classes, Objects and Methods;** Inheritance Classes, Objects and Methods-Introduction, Defining a Class, Fields Declaration, Methods Declaration, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members. Inheritance: Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalize Methods, Abstract Methods and Classes, Visibility Control.	**08**
III	**Packages and Interfaces** Packages: Defining a Package, Finding Packages and CLASSPATH, A Short Package Example, Access protection: An Access Example, Importing Packages. Interfaces: Defining an Interface, Implementing Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces, Default Interface Methods: A More Practical Example, Multiple Inheritance Issues, and Use Static Methods in an Interface.	**08**
IV	**Exception Handling and Generics** Exception Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch: Displaying a Description of an Exception, Multiple Catch Clauses, throw, throws, finally. What Are Generics? A Simple Generics Example, The General Form of a Generic Class, Creating a Generic Method, Generic Constructors, Some Generic Restrictions.	**08**
V	**Programming with I/O** I/O Basics, Streams, Byte Streams and Character Streams, The Predefined Streams, Reading Console Read the values, Reading Characters, Reading Strings, Writing Console Output, The PrintWriter Class, Reading and Writing Files, Automatically Closing a File.	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Discuss the Object Oriented Programming concepts and apply the same to design programs.
CO2	Design and implement object oriented solutions involving multiple objects, packages& Interfaces.
CO3	Develop simpler, reliable and reusable programs using exception handling and Generics.
CO4	Illustrate the versatility of I/O Operations in programs.

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3			1							3		
CO2	2	3			1							3		
CO3	2	3			1							3		
CO4	2				1							3		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Programming with Java	E Balagurusamy	6th Edition, McGraw Hill, 2019, ISBN: 13-89351343202, ISBN: 10-9351343200
2	Java - The Complete Reference	Herbert Schildt	9th Edition, Tata McGraw Hill, 2014, ISBN:978-0-07180856-9

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Introduction to JAVA Programming	Y. Daniel Liang	10th Edition, Pearson Education,2015, ISBN-13: 9780133761313

Department: Artificial Intelligence and Machine Learning	Semester:	3

Subject: AM Department Skill Lab-1				
Subject Code:	22AM306		L – T – P - C:	0–0–4–2

Sl. No	Course Objectives
1	To develop skills to design and analyze simple linear and nonlinear data structures.
2	To Strengthen the ability to identify and apply suitable data structure for the given real world problem.
3	To gain knowledge in practical applications of data structures.

LAB CONTENT

Sl. No	Experiment Description
1	Write a C program to construct a stack of integers and to perform the following operations on it: a. Push b. Pop c. Display . The program should print appropriate messages for stack overflow and stack underflow.
2	Write a recursive C programs for the following: a. Searching an element on a given list of integers using the binary search method. b. Solving the Towers of Hanoi problem
3	Write a C Program to convert and print a given valid parenthesized infix expression consists of single character operands and the binary operators + (plus), - (minus), * (multiply) , /(divide) to suffix / postfix expression.
4	Write a C program to evaluate a valid suffix / postfix expression using stack. The suffix / postfix expression is read as a non-negative single digit operands and binary operators + (plus), - (minus), * (multiply) , /(divide)
5	Write a C program to simulate the working of a Queue of integers using an array. provide the following operations: a. Insert b. Delete c. Display The program should print appropriate messages for Queue full and Queue empty.
6	Write a C program to simulate the working of a Circular Queue of integers using an array. Provide the following operations: a. Insert b. Delete c. Display The program should print appropriate messages for Circular Queue full and Circular Queue empty.
7	Write a C program to simulate the working of a Priority Queue of integers using an array. Provide the following operations: a. Insert b. Delete c. Display
8	Write a C program using dynamic variables and pointers, to construct a Singly Linked List consisting of the following information in each node: student ID (integer), student name (string) and semester (integer). The operations to be supported are: a. The insertion operation: i. At the front of a list ii. At the back of the list

	iii. At any position in the list b. Deleting a node based on student id. c. Searching a node based on student id and update the information content. d. Displaying all the nodes in the list. (Note: Only either (a, b and d) or (a, c and d) may be asked in the examination).
9	Write a C program using dynamic variables and pointers, to construct a Doubly Linked List consisting of the following information in each node: student ID (integer), student name (string) and semester (integer). The operations to be supported are: a. Create a doubly linked list by adding each node at the front. b. Insert a new node to the left of the node whose key value is read as an input c. Delete the node of a given data, if it is found, otherwise display appropriate message. d. Display the contents of the list. (Note: Only either (a, b and d) or (a, c and d) may be asked in the examination).
10	Write a C Program to a. Construct a binary search tree of integers. b. Traverse the tree using inorder, preorder and postorder methods. c. Display the elements in the tree.

Case Studies:

1. **Cashflow Manager -** allows users to have track of their day-to-day cash inflow and outflow. This application has to support user getting a clear idea of their income and expenses. The application has to make users aware of needless expenses and helps to understand money management.
2. **Mini Voting System -** allows groups to securely conduct votes and elections. A high-quality online voting system should balances ballot security, convenience, and the overall requirements of an organization's voting event.
3. **Bank Management System -** users can perform banking activities like in a real bank. This particular file should contain all the details of requirement collection from the user end.
4. **Automated Teller Machine (ATM) -** enables bank customers to access their accounts without visiting the bank. When a user requires to withdrawing cash, they have to enter their PIN number (personal identification number) and the amount to be withdrawn should be displayed in the form of 100s, 500s, and 1000s. Once their withdrawal was successful, the amount should be debited from their account.

Course Outcomes:

Course outcome	Descriptions
CO1	Elicit the Working principles of data structures.
CO2	Identity and Apply appropriate data structure for efficient data storage and retrieval.
CO3	Illustrate the role of data structures in improving the efficiency of a code snippet.

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2		1	2									
CO2		2	3	1										
CO3		3	3	2										

Department: Artificial Intelligence and Machine Learning			Semester:	3
Subject: Universal Human Values				
Subject Code:	22HV307		L – T – P - C:	2-0-0-1

Sl. No	Course Objectives
1	This introductory course input is intended: To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings
2	To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3	To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.
4	This course is intended to provide a much needed orientation input in value education to the young enquiring minds.

Unit	Description	Hrs
I	**Introduction to Value Education:** 1.Understanding Value education-Need, Guidelines, content, Role of education-Sanskar 2. Process for Value Education- Self-exploration, the Dialogue Within. 3. Continuous Happiness and Prosperity – the Basic Human Aspirations 4. Right Understanding, Relationship and Physical Facility 5. Exploring the Meaning of Happiness and Prosperity. 6. Method to Fulfill the Basic Human Aspirations	**06**
II	**Harmony in the Human Being:** 7. Understanding the Human being (As the Co-existence of the Self and Body) 8. **Distinguishing** between the Needs of the Self and the Body 9. The Body as an Instrument of the Self-The response of the self and the body 10: Understanding Harmony in the Self-State of imagination 11:Understanding Harmony of the Self with the Body 12: Programme to ensure self-regulation and Health-Nurturing the body	**06**
III	**Understanding Harmony in the Family and Society** 13: Harmony in the Family – the Basic Unit of Human Interaction 14: Values in Human-to-Human Relationship 15: 'Trust' – the Foundational Value in Relationship 16: 'Respect' – as the Right Evaluation 17: Other Naturally Acceptable Feelings in Relationship-Affection, Care,	**06**

	Guidance, Reverence, Glory, Gratitude and Love 18: Vision for the Universal Human Order-from family to world family	
IV	**Understanding Harmony in the Nature/Existence:** 19: Understanding Harmony in the Nature 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature 21:Realizing Existence as Co-existence at All Levels 22: The Holistic Perception of Harmony in Existence	**04**
V	**Implications of the Holistic Understanding – a Look at Professional Ethics** 23: Natural Acceptance of Human Values 24: Definitiveness of (Ethical) Human Conduct 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order 26: Competence in Professional Ethics 27: Holistic Technologies, Production Systems and Management Models Typical Case Studies 28: Strategies for Transition towards Value-based Life and Profession	**06**

Course Outcomes:

Course outcome	Descriptions
CO1	By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
CO2	They would have better critical ability, also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
CO3	It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.
CO4	This is only an introductory foundational input. It would be desirable to follow it up by a) Faculty-student or mentor-mentee programs throughout their time with the institution. b) Higher level courses on human values in every aspect of living.

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1				1		3	3	3	2	3				
CO2				2		3	3	3	2	3				
CO3				2		3	3	3	2	3				
CO4				2		3	3	3	2	3				

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	A Foundation Course in Human Values and Professional Ethics,	R R Gaur, R Sangal G P Bagaria	Excel Books, New Delhi,2010
2	The Teacher's Manual Teachers' Manual for A Foundation Course in Human Values and, Professional Ethics,	R R Gaur, R Asthana, G P Bagaria	2nd Revised Edition, Excel Books,New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	JeevanVidya: EkParichaya,.	A Nagaraj	JeevanVidyaPrakashan, Amarkantak, 1999.
2	Human Values,	A.N. Tripathi	New Age Intl. Publishers, New Delhi, 2004
3	The Story of Stuff (Book). . i)Small is Beautiful ii)Slow is Beautiful	E. F Schumacher Cecile Andrews	
4	The Story of My Experiments with Truth	Mohandas Karamchand Gandhi	

Department: Artificial Intelligence and Machine Learning			Semester:	3
Subject: Environmental Studies				
Subject Code:	22ES308		L – T – P - C:	2-0-0-1

Sl. No	Course Objectives
1	To identify the major challenges in environmental issues and evaluate possible solutions.
2	Develop analytical skills, critical thinking and demonstrate socio-economic skills for sustainable development.
3	To gain knowledge on different types of pollution in the environment.
4	To analyze an overall impact of specific issues and develop environmental management plan environment.

Unit	Description	Hrs
I	Introduction: Environment - Components of Environment Ecosystem: Types of Ecosystem, Balanced ecosystem. Human Activities – Food, Shelter, And Economic & Social Security, Effects of human activities on environment-Agriculture, Housing, Industry, Mining & Transportation. Environmental Impact Assessment (EIA), Sustainable Development.	**06**
II	Natural Resources-Introduction, types of resources, Water resources – Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water. Mineral resources**,** Forest Wealth. Material Cycles – Carbon Cycle, Nitrogen Cycle &Sulphur Cycle.	**06**
III	Energy – Different types of energy, Conventional sources & Non-conventional sources of energy Solar energy, Hydro electric energy, Wind Energy, Nuclear energy, Biomass & Biogas Fossil Fuels, Hydrogen as an alternative energy.	**04**
IV	Environmental Pollution – Air Pollution & Automobile Pollution Water Pollution, Noise pollution, Land Pollution, Public Health Aspects. Global Environmental Issues: Population Growth, Urbanization, Land Management, Water & Waste Water Management.	**06**
V	Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, controlling measures. Solid Waste Management, E - Waste Management & Biomedical Waste Management -Sources, Characteristics & Disposal methods. Environmental Acts & Regulations, Role of government, Legal aspects, Role of Non-governmental Organizations (NGOs) , Environmental Education	**06**

Course Outcomes:

Course outcome	Descriptions
CO1	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale.
CO2	Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
CO3	Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components.
CO4	Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	1	3	3	2	2	2	1	3		
CO2	2	2	1	1	1	3	3	2	2	2	1	1		
CO3	2	2	1	1	1	3	3	2	2	2	1	1		
CO4	2	2	1	1	1	3	3	2	2	2	1	1		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Environmental Studies	Benny Joseph	Tata McGraw– Hill Publishing Company Limited(2005), Delhi.
2	Environmental Studies	R Rajagopalan	From Crisis to Cure", Oxford University Press, 2005,

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Environmental Science and Engineering	Aloka Debi	Universities Press (India) Pvt. Ltd. 2012
2	Environmental Studies	R.J.Ranjit Daniels and JagadishKrishnaswamy	Wiley India Private Ltd., New Delhi(2009),
3	Text Book of Environmental and Ecology",	Dr.Pratiba Sing, Dr.AnoopSingh and Dr.PiyushMalaviya	Acme Learning Pvt. Ltd. New Delhi
4	Environmental Science – working with the Earth	G.Tyler Miller Jr.	EleventhEdition, Thomson Brooks /Cole, 2006

SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU

(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)

Academic year 2023-2024

Scheme of Teaching and Examination-2022 (160 Credits Scheme, NEP)

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2022-23)

IV Semester B.E **Academic year: 2023-24**

Sl No	Course Code		Course Title	Teaching Dept.	L	T	P	Credits	CIE Marks	SEE Marks	Total Marks	Exam Hours
1	BS	22SS401	Combinatoricsand Advanced Linear Algebra	MA	3	-	-	3	50	50	100	3
2	PC	22AM402	Web Technologies	AM	3	-	-	3	50	50	100	3
3	PC	22AM403	Design and Analysis of Algorithms	AM	3	-	2	4	50	50	100	3
4	PC	22AM404	Embedded Systems and IOT	AM	3	-	2	4	50	50	100	3
5	PC	22AM405	Software Engineering	AM	3	-	-	3	50	50	100	3
6	PC	22AM406	AM Department Skill Lab-2	AM	-	-	4	2	50	50	100	3
7	HS	22SK407	Skill Development-I	HS	2	-	-	1	50	-	50	-
8	HS	22CI408	Constitution of India	HS	2	-	-	1	50	-	50	-
L: Lecture, T-Tutorial, P-Practical/Drawing, CIE: Continuous Internal Evaluation, SEE: Semester End Examination				**Total**	**19**	**-**	**8**	**21**	**400**	**300**	**700**	-
Credits Distribution: Basic Science (BS)=08+08+3+3 = 22, Engineering Science (ES) = 10+11 = 21, Humanities & Social Sciences (HS)=1+2+2 = 5, Program Core (PC) = 02+16+16 = 34, Total Credits = 20+20+21+21 = 82. Total 60 AICTE Activity points need to earn by each regular student and Total 35 AICTE Activity points need to earn by each Lateral entry student at the end of 2nd Year BE.												

Department: Artificial Intelligence and Machine Learning	**Semester:**	**4**

Subject: Combinatorics and Advanced Linear Algebra				
Subject Code:	**22SS401**		**L – T – P - C:**	**3–0–0–3**

Sl. No	Course Objectives
1	To introduce the concept of generating function, exponential generating functions.
2	Describe the concepts of Derangements, Rook polynomials.
3	To solve simultaneous algebraic equations using methods of matrix algebra.
4	To introduce concepts of inner products to matrix decomposition.

Unit	Description	Hrs
I	**The** principle **of Inclusion and Exclusion:** The principle of Inclusion and Exclusion, Generalizations of Principle. Derangements, Rook Polynomials, Arrangements with forbidden positions.	**08**
II	**Generating functions:** Ordinary Generating functions**,** Definition and problems. Calculational Techniques, Partition of Integers, Exponential generating function, problems.	**07**
III	**Vector spaces**: Solution of system of equations by LU decomposition method. Vector space, Subspaces, Linear Combinations, Linear Spans, row space and column space of a Matrix, Linear Dependence and Independence (all statements only).**Basis and Dimensions:** Basis and Dimensions of Vector space and problems.	**09**
IV	**Linear transformation:** Introduction, Linear Mappings, Kernel and Image of a linear transformations, Matrix representation of linear transformations, Range space, Null space, Nullity, Rank-Nullity Theorem, Singular and Nonsingular linear transformations (all statements only), Problems.	**08**
V	**Inner Product spaces:** Inner product, norms of a vector, angle between vectors. Orthogonal vectors, orthogonal and orthonormal basis, projections of a vector. Gram-Schmidt orthogonalization process, QR-factorization (all statements only),problems.**Diagonalization** of a matrix (symmetric matrices) and singular value decomposition, Problems.	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Understand the concept Principle of inclusion-exclusion, Rook polynomial, generating function, vector space, linear transformations.
CO2	Apply the techniques of QR and singular value decomposition for data compression, least square approximation in solving inconsistent linear systems.
CO3	Apply the knowledge of Rook polynomial, linear algebra to model and solve that appears in engineering sciences.
CO4	Apply the idea of generating functions, transformations and orthogonal projection in Engineering field.

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3	2												
CO3	3	2												
CO4	3	2												

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Discrete and Combinatorial Mathematics	Ralph P. Grimaldi	5th Edition, 2006, Pearson Education, ISBN-13: 978-81-7758-424-0.
2	Linear Algebra and its Applications	David C. Lay	3rd Edition, 2002, Pearson Education India, ISBN-13: 978-81-7758-333-5.

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Linear Algebra and its Applications	Gilbert Strang	4th Edition, 2006, Cengage Learning India Edition, ISBN: 81-315-0172-8.

Department: Artificial Intelligence and Machine Learning			**Semester:**	**4**
Subject: Web Technologies				
Subject Code:	**22AM402**		**L – T – P - C:**	**3–0–0–3**

Sl. No	Course Objectives
1	To introduce the fundamentals of the Internet, and the principles of web design.
2	To construct basic websites using HTML and Cascading Style Sheets.
3	To build dynamic web pages with validation using Java Script, JQuery objects and by applying different event handling mechanisms.
4	To develop modern interactive web applications using JAVA

Unit	Description	Hrs
I	**How web works:** Definitions and history, The client server model,(till 1.3.5)where is the internet?, Domain Name system, Uniform Resource locators, **Introduction to HTML:** what is HTML? and where did it come from, HTML syntax, Semantic Markup, structure of HTML documents, Quick tour of HTML elements, HTML5 Semantic structure elements. **HTML Tables and forms**: Introducing Tables, styling Tables, Introducing forms, form control elements, Table and form accessibility, Microformats.	**08**
II	**Introduction to CSS:** What is CSS?, CSS syntax, Location of styles, Selectors, The cascade: how styles interact, The Box model, CSS text styling. **JavaScript: Client side scripting:** What is JavaScript and what can it do, JavaScript design Principles. Where does JavaScript go, syntax, JavaScript objects, The Document Object model (DOM), JavaScript events, Forms, jquery foundations (15.2).	**08**
III	**Web Frameworks: Introducing Bootstrap 4**:Aadvantages, Implementing frame work files, Inserting the JavaScript files, starter template, Normalizing and Rebooting, Taking the starter template further, Using a static site generator, Converting the base template to a generator, Setting up the layout, **Working with layouts:** layouts, containers, creating a three column layout, **Working with content:**Reboot defaults and basics, how to style images, coding tables, **Playing with components:** Buttons, outlines, checkbox, radio	**08**
IV	**JDBC:** The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC /ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions.	**08**
V	**Servlet:** Background; The Life Cycle of a Servlet; Servlet Development Options, Using Tomcat; A simple Servlet; The Servlet API; The javax.servlet Package; Reading Servlet Parameter; The javax.servlet.http package; Handling HTTP Requests and Responses, Using Cookies, Session Tracking.	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Explain the fundamentals of web Technologies.
CO2	Design and validate webpages using style sheets or frameworks.
CO3	Apply the JDBC APIs for accessing databases.
CO4	Illustrate the use of servlet APIs and JSP scriplets
CO5	Design the single page websites.

Course Articulation Matrix

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1												
CO2	3	2			3									
CO3	2	1	1	2	3									
CO4	2	1	1		1									
CO5	2				2									

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Fundamentals of Web Development	Randy Connollyy, Ricardo Hoar	2nd edition, Pearson, 2017, ISBN 13: 978-0-13-340715-0
2	Learning Bootstrap 4	Matt Lambert	2nd edition, PACKT Publishing(open source), 2016 ISBN 978-1-78588-100-8
3	Java - The Complete Reference	Herbert Schildt	9th Edition, Tata McGraw Hill, 2014 ISBN: 978-1-25-900659-3
4	J2EE - The Complete Reference	Jim Keogh	Enterprise Edition, Tata McGraw Hill, ISBN-13:978-0-07-052912-0ISBN-10: 0-07-052912-4

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Programming the World Wide Web	Robert. W. Sebesta	8th edition, Pearson,2015, ISBN-13: 978-0-13-377598-3
2	Introduction to Java Programming	Y Daniel Liang	10th edition, PHI ISBN-13: 978-0133761313 ISBN-10: 0133761312
3	The Java® Language Specification	James GoslingBill Joy Guy SteeleGiladBracha Alex Buckley	Java SE 7 Edition ISBN-13: 978-0133260229 ISBN-10: 0133260224

Department: Artificial Intelligence and Machine Learning	**Semester:**	**4**

Subject: Design and Analysis of Algorithms				
Subject Code:	**22AM403**		**L – T – P - C:**	**3 – 0 – 2 – 4**

Sl. No	Course Objectives
1	Learn the concepts of recursive and non-recursive algorithms.
2	Know different Algorithm Design Techniques for effective problem solving.
3	Analyze the algorithm with respect to space and time complexity.
4	Understand basic efficiency classes and asymptotic notations to express the complexity.

Unit	Description	Hrs
I	**Introduction, Fundamentals of the Analysis of Algorithm Efficiency:** What is an Algorithm?, Fundamentals of algorithmic problem solving, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Non-Recursive and recursive Algorithms with Examples. **Brute Force:** Selection Sort, String Matching, Exhaustive Search.	**08**
II	**Divide and Conquer:** Merge Sort, Quick Sort, Finding the minimum and maximum **element** in an array. **Decrease and Conquer:** Insertion Sort, DFS, BFS and Topological Sorting.	**08**
III	**Transform and Conquer:** Balanced Search Trees: AVL Tree and 2-3 Tree, Heaps and Heap Sort.**Space and Time Tradeoffs:** Input Enhancement in String Matching: Horspool‘s algorithm,	**08**
IV	**Dynamic Programming:** Floyd‘s Algorithms, Knapsack Problem and Memory Functions. **Greedy Technique:** Prim‘s algorithm, Kruskal‘s algorithm, Dijkstra‘s algorithm.	**08**
V	**Back tracking:** n-Queen‘s Problem, Subset-Sum Problem. **Branch and Bound:**Assignment Problem and Traveling Salesman Problem.	**08**

LAB CONTENT

Sl. No	Experiment Description
1	Sort a given set of elements using Merge sort.
2	Sort a given set of elements using Quick Sort.
3	Finding the Maximum and Minimum element in an array of ‘n’ integers.
4	Print the vertices of the directed acyclic graph in topological order.
5	Create a heap tree for a given list of N elements. And sort the elements using Heap Sort technique.
6	ImplementHorspool algorithm for String Matching.
7	Find Minimum Cost Spanning Tree of a given undirected graph using Prim’s algorithm.
8	From a given vertex in a weighted connected graph, find the shortest paths to other vertices using Dijkstra’s algorithm.
9	Find all pair shortest path using Floyd’s Algorithm.
10	Find a subset of a given set S of N positive integers whose sum is equal to a given positive integer D.

Course Outcomes:

Course outcome	Descriptions
CO1	Understand the basic concepts of design and analysis of algorithms.
CO2	Demonstrate various techniques for designing and developing algorithms.
CO3	Design an algorithm using various design techniques and analyze its complexity to rank order of growth.
CO4	Solve the given problem instance using appropriate algorithm design technique.

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2											
CO2	1	3	3	2										
CO3		2	2	2								1		
CO4	2	3	3	2										

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Introduction to the Design & Analysis of Algorithms	AnanyLevitin	3rd Edition,Pearson Education, 2012 ISBN-13: 978-0-13-231681-1

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Introduction to Algorithms	Cormen T.H, Leiserson C.E. &Rivest R.L	3rdEdition, PHI,2009, ISBN-13: 9780262033848
2	Computer Algorithms/C++	Ellis Horowitz, SatrajSahni and Rajasekaran	2ndEdition, Universities Press, 2014, ISBN-13:978-8173716119

Department: Artificial Intelligence and Machine Learning	**Semester:**	**4**

Subject: Embedded Systems and IoT				
Subject Code:	**22AM404**		**L – T – P - C:**	**3 – 0 – 2 – 4**

Sl. No	Course Objectives
1	Understand the operating principles of digital circuits and Sensors.
2	Equip with the skills to Design and Analyze combinational and sequential digital circuits.
3	Learn to Apply the concepts of digital circuits and sensors in real time applications.
4	Acquire the knowledge to Simulate digital circuits using Hardware Descriptive Language (HDL).

Unit	Description	Hrs
I	**Introduction to Digital Circuit Simplification Techniques** Algebraic Simplification using SOP and POS techniques, Karnaugh's map (4 Variables) and QuineMc-Cluskey methods (Algorithm). Introduction to HDL.	**08**
II	**Combinational logic circuits**Design of Half adder, Full adder and 4 bit adder (IC7483), Multiplexers, De-multiplexers, Decoder: BCD to Decimal Decoders, Seven Segment Decoders, Combinational circuit design using MUX IC 74153 and Decoder IC 74138. Encoders, Magnitude Comparator and ALU IC74181. HDLImplementation of combinational Circuits.	**08**
III	**Sequential Circuits** Introduction to Flip-Flops: Basic RS latch RS Flip-Flop, Gated Flip- Flops: JK FF, D FF, T FF. Various representations of flip flops and Flip flop conversions. Register: Types of Registers: Serial In – Serial Out, Serial In– Parallel out, Parallel in Serial Out, Parallel In – Parallel Out, Universal Shift Register, and Applications of Shift Registers. Counters: Asynchronous Counters, Decoding Gates, Synchronous Counter Changing the Counter Modulus. HDL implementation of sequential circuits	**08**
IV	**Introduction to sensors and Microcontroller (Aurduino)** Transducers, Classification, Roles of sensors in IOT, Working principles of sensors(IR, Photodiode, LED, LDR, Rain Sensor and Temperature sensor) Role of actuators, types of actuators. Introduction to Microprocessors and Microcontroller, Arduino Specifications, Arduino Components, Arduino IDE software, Hands on example, Hands-on Example: A Simple Arduino "Hello World" Program.	**08**
V	**Programming an ArduinoIoT Device** Preparing the development environment (Arduino IDE), Exploring the Arduino language using C syntax, Coding, compiling, and uploading to the microcontroller, Working with Arduino Communication Modules: Bluetooth Modules, WiFi Modules Interfacing arduino and Blink via USB : LED Blinking, motion detection, Environmental Sensor Projects (Rain Sensor and Temperature sensor), photo diode and LDR sensor projects	**08**

LAB CONTENT

Sl. No	Experiment Description
1	Introduction to IoT toolkit – Familiarization with Arduino/RaspberryPi/ESP8266/NodeMCU and perform necessary SW installations
2	Experiment to interface temperature sensor DHT11 and write a program to print the temperature and humidity reading
3	Build a Motion detector using a PIR sensor and display appropriate messages
4	Develop and execute the following using the GenuinoAurdino Uno: Controlling the LED with a push button – turn on /turn off LED photo resistors LDR) – switch on the LED when light level goes below a particular threshold.
5	Develop and execute the following using the GenuinoAurdino Uno: Rain Indicator using a Rain sensor and a water source
6	To Interface Actuators Using Arduino Uno board☹ Controlling two actuators using Arduino)
7	To create Things Speak account for uploading the sensors data(Creation of things speak account)
8	To control the actuator from cloud (Actuator controlling through cloud)
9	To Interface DHT11 Using Arduino Uno board and upload sensor data to Cloud (DHT11sensor data to cloud)
10	To Interface MQ-7and MQ-135 Sensor Using ArduinoUnoboardto measure Carbon monoxide and Ammonia gas. (IoT based air pollution control system)

Course Outcomes:

Course outcome	Descriptions
CO1	Explain the basic concepts of digital circuit and Arduino/Raspberry Pi architecture.
CO2	Design and Analyze simple Combinational and Sequential logic circuits.
CO3	Apply the digital circuit concepts and Arduino/RaspberryPi platforms to develop small engineering applications.
CO4	Simulate digital circuits using HDL coding.
CO5	Use modern engineering tools to develop digital circuit applications in a team.

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2			1										
CO2	3	2	3		2									
CO3	3	1	1			1								
CO4	2	1			3									
CO5	1				3									

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Digital principles and Applications	Donald P Leach, Albert Paul Malvino	8th Edition, McGraw Hill,2014, ISBN: 9789339203405
2	Arduino and Raspberry Pi Sensor Projects for the Evil Genius	Robert Chin	McGraw-Hill Education, 2018, ISBN: 9781260010893

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Digital principles and Design	Donald D Givone	3rd Edition , 2003, Mc Hill Publications ISBN:0072525037
2	Arduino Fundamentals and Applications	Prof. Amit Kumar Mishra	BFC Publications,2021, ISBN: 9789390478590

Department: Artificial Intelligence and Machine Learning			**Semester:**	**4**
Subject: Software Engineering				
Subject Code:	**22AM405**		**L – T – P - C:**	**3–0–0–3**

Sl. No	Course Objectives
1	To gain the knowledge of systematic and disciplined approach for software development and identification of customer requirements for the development of SRS document.
2	To understand different software process models, architectural styles, software system design approaches and their appropriate application.
3	Understand the agile manifesto, principles and the context of agile concrete techniques of design and development that agile teams use to apply.
4	To Appreciate the need of project management and software testing methods.

Unit	Description	Hrs
I	Introduction to Software Engineering – Introduction, Professional software development, Software engineering ethics. Software processes - Software process models, Process activities, Coping with changes, Process Improvement.	**08**
II	Requirements Engineering - Functional and non-functional requirements, Requirements engineering processes, Requirements elicitation, Requirements specification, Requirements validation, Requirements change.	**08**
III	System Modeling – Context models, Interaction models, Structural models, Behavioral models. Architectural design - Architectural design decisions, Architectural views, Architectural patterns, Application architectures.	**08**
IV	Software Evolution – Evolution Process, Legacy Systems, Software Maintenance. Agile Software Development - Agile methods, Agile development techniques, Agile project management, Scaling agile methods	**08**
V	Software Testing - Development testing, Test-driven development, Release Testing, User Testing. Project Management – Risk Management, Managing People, Teamwork	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Able to map client requirements into software specifications by understanding software development life cycle.
CO2	Design and develop software models.
CO3	Able to apply the business values by adopting evolutionary approaches to software development.
CO4	Capable of managing the project and able to assess the software for its robustness.

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1		1	3	3	3		2	1	1		
CO2		3	3				2		1					
CO3		1		3	3				2	1				
CO4											3			

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Software Engineering	Ian Sommerville	10th edition ISBN:978-0-13394303-0, By Ian Sommerville

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Software Engineering –A Practitioners approach	Roger.G. Pressman	7th Edition Tata McGrawhill, 2010, ISBN :978–0–07–337597–7
2	Foundations of Software Testing	Aditya P Mathur	Pearson Education, First Edition, 2011, ISBN-13: 978-8131759080

Department: Artificial Intelligence and Machine Learning	**Semester:**	**4**

Subject: AM Department Skill Lab-2				
Subject Code:	**22AM406**		**L – T – P - C:**	**0–0–4–2**

Sl. No	Course Objectives
1	Understand the fundamentals of Object Oriented Programming concepts in Java.
2	Understand the principles of Packages and Interfaces.
3	Understand I/O programming and multithreading in Java.
4	Create, debug and Implement integrated application.

LAB CONTENT

Sl. No	Experiment Description
1	Write a Java Program that demonstrates the various data types in Java.
2	Write a Java Program that demonstrates the operators in Java.
3	Write a Java Program that demonstrates the control statements in Java.
4	Write a Java Program that demonstrates the looping statements in Java.
5	Write a Java Program that demonstrates stack operations.
6	Write a Java Program that demonstrates method overloading concept.
7	Write a Java program to find the area and volume of a Room. Use a base class rectangle with a constructor and a method for finding the area. Use its subclass Room with a constructor that gets the value of length and breadth from the base class and has a method to find the volume. Create an object of class Room and obtain the area and volume.**Note**: read the input from the keyboard using Scanner class.
8	Write a Java Program that demonstrates dynamic method dispatch concept.
9	Write a Java Program to create an abstract class named shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle subclass that each one of the classes extends the Class Shape. Each one of the classes contains only the methodprintArea() that prints the area of Shape. **Note**: read the input from the keyboard using Scanner class.
10	Design a simple Java program to demonstrate different combinations of access control modifiers for • Same package subclass • Same package non subclass • Different package subclass • Different package non subclass Note: Justify the result with the Access Protection table.
11	Write a Java program which has: i)An interface for Stack Operations that defines push() and pop() methods. ii) A class that implements the Stack Interface and creates a dynamic length Stack and does the stack operations that demonstrate the runtime binding.
12	Write a java program to perform simple command line calculator with an exception handler that deals with nonnumeric operands, then write another program without using an exception handler to achieve the same objective.
13	Write a Java program to create a thread using i) **Runnable** interface ii) **Thread** class.

14	Write a Java program to demonstrate the creation of multiple threads.
15	Write a Java program that correctly implements producer consumer problem using the concept of inter-thread communication.

Course Outcomes:

Course outcome	Descriptions
CO1	Describe the fundamentals of Object-Oriented Programming.
CO2	Identify classes, objects, members of a class and relationships among them needed for specific problem.
CO3	Design and implement object oriented solutions involving multiple objects, Packages and interfaces.
CO4	Develop programs by using exception handling and multithreading mechanisms.

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1		1										
CO2	2	2	1		1									
CO3	3	2	3		3									
CO4	1		1		2									

Department: Artificial Intelligence and Machine Learning			**Semester:**	**4**
Subject: Skill Development-I (Communication Skills and Professional Ethics)				
Subject Code:	**22SK407**		**L – T – P - C:**	**2-0-0-1**

Sl. No	Course Objectives
1	Improve Communication Skills: Enhance students' ability to express ideas clearly, listen actively, and adapt communication style to different contexts and audiences.
2	Foster Effective Teamwork: Develop students' teamwork skills, including cooperation, active participation, conflict resolution, and leveraging diverse strengths for collaborative success.
3	Enhance Leadership Abilities: Cultivate leadership qualities by helping students develop self-awareness, problem-solving skills, and decision-making abilities
4	Promote Professional Etiquette: Instill a sense of professionalism in students, emphasizing appropriate workplace behavior, business etiquette, and ethical conduct.

Unit	Description	Hrs
I	**Communication Skills**: Basics, Method, Means, Process and Purpose, Basics of Business Communication, Written & Oral Communication, Listening. Communication with Confidence & Clarity-Interaction with people, the need the **uses** and the methods, Getting phonetically correct, using politically correct language, Debate & Extempore.	**06**
II	**Assertive Communication-**Concept of Assertive communication, Importance and applicability of Assertive communication, Assertive Words, being assertive. **Presentation Skills:** Discussing the basic concepts of presentation skills, Articulation Skills, IQ & GK, How to make effective presentations, body language & Dress code in presentation, media of presentation.	**05**
III	**Team Work**: Team Work and its important elements Clarifying the advantages and challenges of team work Understanding bargains in team building Defining behavior to sync with team work Stages of Team Building Features of successful teams. Body **Language & Proxemics**: Rapport Building - Gestures, postures, facial expression and body movements in different situations, Importance of Proxemics, Right personal space to maintain with different people.	**05**
IV	**Group discussion, Motivation and Stress Management** a. Theory &Evaluation : Understanding why and how is the group discussion conducted. b. Techniques of group discussion c. Discussion on FAQs of group discussion d. Body language during group discussion Self-motivation, group motivation, leadership abilities, Stress clauses and stress busters to handle stress and de-stress; Understanding stress - Concept of sound body and mind, Dealing with anxiety, tension, and relaxation techniques. Individual Counseling & Guidance, Career Orientation. Balancing Personal & Professional Life	**06**

V	**Interview Skills,Professional Practice** a. Personal and Group Interviews b. Mock Interviews - Questions asked & how to handle them c. Body language in interview d. Etiquette, Dress code in interview e. Behavioral and technical interviews f. Practice on stress interviews, technical interviews, General HR interviews **Professional Practice**: Professional Dress Code, Time Sense, Respecting People & their Space, Relevant Behavior at different Hierarchical Levels. Positive Attitude, Self Analysis and Self-Management. Professional Ethics values to be practiced, standards and codes to be adopted as professional engineers in the society for various projects. Balancing Personal & Professional Life	**06**

Course Outcomes:

Course outcome	Descriptions
CO1	Improved Communication Skills: Students will demonstrate enhanced verbal and written communication abilities, effectively expressing ideas, actively listening, and adapting their communication style to different situations.
CO2	Effective Teamwork and Collaboration: Students will exhibit improved teamwork skills, actively contributing to group projects, resolving conflicts constructively, and leveraging the strengths of team members to achieve shared goals.
CO3	Professional Etiquette and Conduct: Students will display professional behavior, adhering to workplace etiquette, demonstrating appropriate appearance, punctuality, and practicing ethical conduct in professional settings.
CO4	Strengthened Aptitude Skills: Students will demonstrate improved aptitude skills, including logical reasoning, analytical thinking, and problem-solving abilities, enabling them to excel in competitive exams, interviews, and real-life problem-solving scenarios.

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1					2		3	3	3				
CO2	1					2		3	3	3				
CO3	1					2		3	3	3				
CO4	1					2		3	3	3				

Text Books: NIL

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Technical Communication Principles and Practices	Meenakshi Raman and SangeetaSharma	Oxford Publishers, 2004
2	Tools for Talking When Stakes are High	Kerry Patterson, Joseph Grenny, Ron McMillan, Crucial Conversation	McGraw-Hill Publication, ISBN: 9780071772204

Department: Artificial Intelligence and Machine Learning			**Semester:**	**4**
Subject: Constitution of India				
Subject Code:	**22CI408**		**L – T – P - C:**	**2-0-0-1**

Sl. No	Course Objectives
1	To be familiar with salient features and preamble of the constitution of India. Including fundamental rights of the citizen of India and types of Fundamental rights
2	To understand the relevance of directive principles under part-IV, and the responsibilities of the individuals towards society.
3	To understand the powers and functions of the Legislature, Executive, and judicial bodies.
4	To provide the information of FDs, Electoral Process, emergencies and amending procedures.

Unit	Description	Hrs
I	Introduction, Meaning and definitions. Salient features, Sources, Constituent Assembly, Drafting Committee. Preamble to the constitution of India.	**06**
II	Fundamental rights under part III – details of exercise of rights, Scopes & Limitations and, important cases	**06**
III	Relevance of directive principles of state policy under part-IV Fundamental duties and their significance-part-IV A	**04**
IV	Union Executive- President, Prime minister, Parliament and Supreme Court of India. State Executive – Governors, Chief Ministers, State legislature and High Courts.	**06**
V	Constitutional Special Provisions for Scheduled Castes and Tribes, Women, Children and backward classes. Emergency provisions under Part XVIII. Electoral process, Amendment procedure, 42nd, 44th, 74th, 76th, and 91stConstitutional amendments.	**06**

Course Outcomes:

Course outcome	Descriptions
CO1	Have general knowledge and legal literacy and thereby to take up competitive examinations.
CO2	Understand the freedom, rights and restrictions including directives, through fundamental duties.
CO3	Understand the importance of the three main organs of the constitution, Viz-the legislature, the executive and the judiciary.
CO4	Understand the power and functions of political institutions established throughout the country.

Course Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2	1	3	3	2				
CO2						2	2	3	3	2				
CO3						2	3	3	2	2				
CO4						2	2	3	3	2				

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Introduction to the Constitution of India (student edition)	DurgaDasBasu	EEE, 19th/20th Edn.,2001
2	An Introduction to Constitution of India	MV Pylee	Volume-1 Vikas Publishing, 2002

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	An Introduction to Constitution of India	Brijkishore Sharma	Prentice-Hall of India, Volume-12002
2	Constitution of India and Professional Ethics	V. Rajaram	Second Edition New Age International Publication. 2011