DETAILED SYLLABUS FOR 3rd SEMESTER

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY,
EAST DELHI CAMPUS,
SURAJMAL VIHAR-110092

Semester: 3rd			
Paper code: AIDS201/AIML201/IOT201	**L**	**T/P**	**Credits**
Subject: Data Structures	**3**	**0**	**3**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper.
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:	
1.	To understand the basic concepts of data structures.
2.	To perform basic operations on linked list, stacks and queues.
3.	To perform sorting and searching on a given set of data items.
4.	To understand the concepts of trees, hashing, and graph theory.

Course Outcomes:	
CO1	Understand and identify the concepts of fundamentals of data structures and efficient access strategies for solving a computational problem.
CO2	Apply suitable data structure for solving a given problem and differentiate the usage of data structures and their applications.
CO3	Analyse the choice of data structures and their usage for sorting and searching numbers in data structures.
CO4	Create the solution for a particular problem and gain ability to provide solutions/approaches with file handling and tree structures.

CO/PO	**PO01**	**PO02**	**PO03**	**PO04**	**PO05**	**PO06**	**PO07**	**PO08**	**PO09**	**PO10**	**PO11**	**PO12**
CO1	2	2	2	2	1	1	1	1	1	1	1	2
CO2	2	2	2	2	1	1	1	1	1	1	1	2
CO3	2	2	2	2	1	-	-	-	-	-	1	2
CO4	2	2	2	2	1	1	-	-	-	-	1	2

Course Overview:
This subject gives an overview of data structure concepts including arrays, stack, queues, linked lists, trees, and graphs. Discussions shall be held of various implementations of these data structures in real life. This subject also examines algorithms for sorting and searching. The concepts of trees and graph-based algorithms shall be introduced.

UNIT I: **[8]**
Introduction- Introduction to Algorithmic Complexity, Introduction to various data structures, Arrays and Strings operations, Stacks and Queues, Operations on Stacks and Queues, Array representation of Stacks, Applications of Stacks- Recursion, Polish expression and their compilation conversion of infix expression to prefix and postfix expression, Operations of Queues, Representations of Queues Applications of Queues, Priority queues, Overview of the list, set, tuples, and dictionary data structures.

UNIT II: **[8]**
Searching and Sorting- Linear Search, Binary search, Insertion Sort, Quick sort, Radix sort, Merge sort, Heap sort. Linked Lists- Singly linked lists, Representation of linked list, Operations of the Linked list such as Traversing, Insertion, and Deletion, Searching, and applications of Linked List. Concepts of Circular linked list and doubly linked list and their applications. Stacks and Queues as a linked list.

UNIT III: **[8]**
Trees- Basic Terminology, Binary Trees and their representation, binary search trees, various operations on Binary search trees like traversing, searching, Insertion and Deletion, Applications of Binary search Trees, Complete Binary trees, Extended binary trees. General trees, AVL trees, Threaded trees, B- trees, 2-3 trees, 2-3-4 trees, B* and B+ trees.

UNIT IV: **[8]**
File Structure- File Organization, Indexing & Hashing, Hash Functions, Graphs- Terminology and Representations, Graphs & Multi-graphs, Directed Graphs, Representation of graphs and their Transversal, Euler and Hamiltonian paths, Spanning trees, shortest path and Transitive Closure, Topological Sort, and Critical Paths.

Text Books:
1. Tannenbaum. Data Structures, PHI, 2007 (Fifth Impression).
2. An introduction to data structures and application by Jean-Paul Tremblay & Pal G. Sorenson (McGraw Hill).

Reference Books:
1. Data Structures with C - By Schaum Series.
2. R.L. Kruse, B.P. Leary, C.L. Tondo. Data structure and program design in C, PHI, 2009 (Fourth Impression).
3. Gilberg, R. F., & Forouzan, B. A., Data structures: A pseudocode approach with C++. Brooks/Cole Publishing, 2001.

Semester: 3rd			
Paper code: AIDS251/AIML251/IOT251	**L**	**T/P**	**Credits**
Subject: Data Structures Lab	**0**	**2**	**1**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO EVALUATORS: Maximum Marks: As per university norms

1. This is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under the intimation to the office of the HOD/ Institution in which they appear is being offered from the list of practicals below.
3. Instructors can add any other additional experiments over and above the mentioned in the experiment list which they think is important.
4. At least 8 experiments must be performed by the students.

Course Objectives:

1.	To teach students how to analyse different types of data structures.
2.	To design applications based on different types of data structures.

Course Outcomes:

CO1	Design programs using a variety of data structures such as stacks, queues, hash tables, binary trees, search trees, heaps, graphs, B-trees, list, set, tuples, dictionary.
CO2	Implement and analyse abstract data types such as lists, graphs, search trees to solve real world problems efficiently.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	2	2	2	1	-	-	-	-	-	-	1
CO2	2	2	2	2	1	1	1	1	1	1	1	2

LIST OF EXPERIMENTS:

1. Perform Linear Search and Binary Search on an array.
2. Create a stack and perform Pop, Push, and Traverse operations on the stack using array.
3. Create a stack and perform Pop, Push, and Traverse operations on the stack using linked list.
4. Create a Linear Queue using Linked List and implement different operations such as insert, delete, and display the queue elements.
5. Implement the following sorting techniques:

a. Insertion sort
b. Merge sort
c. Bubble sort
d. Selection sort

6. Create a linked list with nodes having information about a student. Insert a new node at the specified position.
7. Create a doubly linked list with nodes having information about an employee and perform Insertion at front of doubly linked list and perform deletion at end of that doubly linked list.
8. Create a circular linked list having information about a college and perform Insertion at the front end and perform deletion at the end.
9. Create a Binary Tree and perform Tree Traversals (Preorder, Postorder, Inorder) using the concept of recursion.
10. Implement insertion, deletion, and display (Inorder, Preorder, Postorder) on binary search tree with the information in the tree about the details of an automobile (type, company, year of make).

Semester: 3rd			
Paper code: AIDS203/AIML203/IOT203	**L**	**T/P**	**Credits**
Subject: Foundations of Data Science	**3**	**0**	**3**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper.
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Everyunit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required

Course Objectives:

1.	To analyse different types of data using Python and .
2.	To prepare data for analysis and perform simple statistical analysis.
3.	To create meaningful data visualizations and predict future trends from data.

Course Outcomes:

CO1	Understand and identify the basic concepts of data science for performing data analysis.
CO2	Apply & perform pre-processing steps along with data visualization to get insights from data.
CO3	Analyse and apply different modules of data science to evaluate mathematical, and scientific problems of data analysis.
CO4	Develop the model for data analysis and evaluate the model's performance to optimize business decisions and create competitive advantage with data analytics.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	1	-	-	-	-	-	1	2
CO2	2	3	3	3	3	1	1	1	1	1	1	2
CO3	2	3	3	3	1	-	-	-	-	-	2	3
CO4	3	3	3	3	1	1	1	1	1	1	2	3

Course Overview:
Foundations of Data Science is a blend of statistical mathematics, data analysis tools and visualization, domain knowledge representation, tools and algorithms and computer science applications. The hidden insights or patterns are identified and analysed to form a decision.

UNIT I: **[8]**
Introduction to data science, applications of data science, data scientist roles and responsibilities, skills needed to become a data scientist. Need of Python for data analysis, Introduction to Data Understanding and Pre-processing, domain knowledge, Understanding structured and unstructured data. Creation of synthetic dataset in MS Excel.

UNIT II: **[8]**
Basics of Python programming: Variables, printing values, if condition, arithmetic operations, loops. Data Analysis process, Dataset generation, Importing Dataset: Importing and Exporting Data, Basic Insights from Datasets, Cleaning and Preparing the Data: Identify and Handle Missing Values.

UNIT III: **[8]**
Basics of essential Python libraries: Introduction to NumPy, Pandas, Matplotlib, SciPy. Data Processing, Data Visualization, Basic Visualization Tools, Specialized Visualization Tools, Seaborn Creating and Plotting Maps.

UNIT IV: **[8]**
Mathematical and scientific applications for data Analysis, Basics of Supervised and Unsupervised Learning. Decision Making. Trend & predictive mining using Python, Recommender systems.

Text Books:
1. Wes Mckinney. Python for Data Analysis, First edition, Publisher O'Reilly Media.
2. Foundational Python for Data Science, 1st edition, Kennedy Behrman, Pearson Publication.
3. Data analytics using Python, Bharti Motwani, Wiley Publication.

Reference Books:
1. Allen Downey, Jeffrey Elkner, Chris Meyers, Learning with Python, Dreamtech Press.
2. Reema Thareja. Python Programming using Problem Solving approach, Oxford University press.

Semester: 3rd			
Paper code: AIDS253/AIML253/IOT253	**L**	**T/P**	**Credits**
Subject: Foundations of Data Science Lab	**0**	**2**	**1**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO EVALUATORS: Maximum Marks: As per university norms

1. This is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under the intimation to the office of the HOD/ Institution in which the appear is being offered from the list of practicals below.
3. Instructors can add any other additional experiments over and above the mentioned in the experiment list which they think is important.
4. Atleast 8 experiments must be performed by the students.

Course Objectives:

1.	To analyse different types of data using Python.
2.	To perform statistical analysis and create meaningful data insights.

Course Outcomes:

CO1	Apply data science principles to identify meaningful solutions to actual problems.
CO2	Analyse and create programs based on statistical analysis using different libraries of Python programming language.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	3	1	1	2	1	1	1	2
CO2	3	3	3	3	3	1	1	2	1	1	1	2

LIST OF EXPERIMENTS:

1. Introduction and installation of Python and Python IDEs for data science (Spyder-Anaconda, Jupyter Notebook etc.)
2. Design a Python program to generate and print a list except for the first 5 elements, where the values are squares of numbers between 1 and 30.
3. Design a Python program to understand the working of loops.
4. Design a Python function to find the Max of three numbers.
5. Design a Python program for creating a random story generator
6. Create a synthetic dataset (.csv/.xlsx) to work upon and design a Python program to read and print that data.
7. Design a Python program using NumPy library functions.
8. Perform Statistics and Data Visualization in python.

9. Design a Python program to implement Linear Regression

10. Design a Python program to create a recommender system

Faculties should also motivate students to make a project on the topics taught in theory and lab.

Semester: 3rd			
Paper code: AIDS205/AIML205/IOT205	**L**	**T/P**	**Credits**
Subject: Digital Logic Design	**3**	**0**	**3**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	To teach various number systems, binary codes and their applications.
2.	To familiarize the students with the importance of error detection and error correction codes.
3.	To inculcate concepts of K-MAP to simplify a Boolean expression.
4.	To facilitate students in designing a logic circuit.

Course Outcomes:

CO1	Understand number systems and complements for the basic functionality of digital systems
CO2	Identify the importance of canonical forms in the minimization or other optimization of Boolean formulas in general and digital circuits.
CO3	Apply and evaluate circuits of minimizing algorithms (Boolean algebra, Karnaugh map or tabulation method).
CO4	Design procedures of combinational and sequential circuits.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	2	2	2	1	-	-	-	-	-	-	1
CO2	2	2	2	2	1	-	-	-	-	-	-	1
CO3	2	2	2	2	1	-	-	-	-	-	-	1
CO4	2	2	2	2	1	-	-	-	-	-	-	1

Course Overview:

The course addresses the concepts of digital systems logic design, and techniques of designing digital systems. The course teaches the fundamentals of digital systems applying the logic design and development techniques. This course forms the basis for the study of advanced subjects like Computer Organization and Architecture, Microprocessor through Interfacing, VLSI Designing.

UNIT I: **[8]**

Digital systems, binary numbers, number base conversions, octal and hexadecimal numbers, complements, signed binary numbers, binary codes, error detection and error correction codes. Boolean Algebra and Logic Gates: Basic definitions, axiomatic definition of Boolean algebra, basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, digital logic gates.

UNIT II: **[8]**

GATE level minimization, Logic gates and Logic families, The K-map method, four-variable map, five-variable map, product of sums simplification, don't-care conditions, NAND and NOR implementation, determination and selection of Prime Implicants, Essential and Nonessential
prime Implicants.

UNIT III: **[8]**

Combinational logic and their Design procedure, Binary Adder, Binary Subtractor, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, and Demultiplexers.
Memories such as ROM, RAM, EPROM.

UNIT IV: **[12]**

Sequential logic and circuits, latches, flip-flops, analysis of clocked sequential circuits, State reduction and assignment, design procedure. REGISTERS AND COUNTERS: Registers, shift registers, ripple counters, synchronous counters, counters with unused states, ring counter, Johnson counter. Random access memory, memory decoding, error detection and correction, read only memory, programmable logic array, programmable array logic, sequential programmable devices. A/D and D/A converters.

Text Books:

1. M. Morris Mano, Michael D. Ciletti (2008), Digital Design, 4th edition, Pearson Education Inc, India.
2. Donald D. Givone (2002), Digital Principles and Design, Tata McGraw Hill, India.

Reference Books:

1. C. V. S. Rao (2009), Switching and Logic Design, 3rd Edition, Pearson Education, India.
2. Roth (2004), Fundamentals of Logic Design, 5th Edition, Thomson, India.

Semester: 3rd			
Paper code: AIDS255/AIML255/IOT255	**L**	**T/P**	**Credits**
Subject: Digital Logic Design Lab	**0**	**2**	**1**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO EVALUATORS: Maximum Marks: As per university norms	
1. This is the practical component of the corresponding theory paper. 2. The practical list shall be notified by the teacher in the first week of the class commencement under the intimation to the office of the HOD/ Institution in which the appear is being offered from the list of practicals below. 3. Instructors can add any other additional experiments over and above the mentioned in the experiment list which they think is important. 4. At least 8 experiments must be performed by the students.	
Course Objectives:	
1.	To familiarize with the understanding of various aspects of designing real life applications through digital logic.
2.	Design and analysis of the digital circuits and systems.
Course Outcomes:	
CO1	Design an experiment to validate through hypothesis, a Boolean logic gates, truth table and circuit simulation.
CO2	Create circuits to solve real life problems via digital logic design.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	2	2	2	1	-	-	-	-	-	-	1
CO2	2	2	2	2	1	1	1	1	1	1	1	1

LIST OF EXPERIMENTS:

1. a) Introduction to Digital Logic Trainer kits and their function.

   b) Verify the truth table of Basic logic gates using their ICs.

   c) Realize logic functions of NOT, AND, OR, EX-OR, EX-NOR with the help of universal gates-NAND and NOR Gates.
2. a) Verify De-Morgan's theorem for two variables using basic gates.

   b) Realize Sum of Product (SOP) and Product of sum (POS) expressions using universal gates.
3. Realize Binary to Gray & Gray to Binary code converter and their truth table.
4. Design and test the Adder circuit.

a) Half Adder
b) Full Adder
c) Parallel Adder using 7483

5. Design and test the Subtractor circuit.
    a) Half Subtractor
    b) Full subtractor
6. Design and test the Multiplexer circuit.
    a) 8:1 Multiplexer using IC 74151
    b) 1:8 Demultiplexer circuit using IC 74138
7. Verify and test the Counter circuit.
    a) BCD Counter using ICs 7493
    b) Ring counter using 7495
    c) Johnson Ring Counter using 7495
8. Design and implement Comparator circuit.
    a) 1 bit comparator
    b) 4 bit magnitude Comparator using 7485
9. Design and implement Encoder circuit.
    a) Decimal to BCD Encoder using IC 74147
    b) Octal to Binary Encoder using IC 74148
10. Verify 2:4 Decoder using seven segment decoder and using ICs 7447.
11. Investigate the operation of various Flip-Flops using IC 7400, 7410.
    a) SR & Clocked Flip flop
    b) D flip flop
    c) T flip flop
    d) JK flip flop
12. Realize Shift Register using ICs 7495.
    a) SISO (Serial in Serial out)
    b) SIPO (Serial in Parallel out)
    c) PIPO (Parallel in Parallel out)
    d) PISO (Parallel in Serial out)

Semester: 3rd			
Paper code: AIDS207/AIML207/IOT207	**L**	**T/P**	**Credits**
Subject: Principles of Artificial Intelligence	**3**	**0**	**3**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	To understand the basic concepts of Artificial Intelligence, its principles, and techniques.
2.	To analyse the applicability of the basic knowledge representation, reason under uncertainty, develop a plan for concrete computational problems, and learn from experiences to solve various problems
3.	To Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
4.	To devise development tools such as prediction models, expert systems, and data mining tools.

Course Outcomes:

CO1	Understand theories and concepts necessary for building an Artificial Intelligent System for knowledge representation.
CO2	Apply heuristic algorithms to develop better searching algorithms for solving real-world problems.
CO3	Analyse and understand concepts of Neural Networks and Fuzzy data to deal with uncertainty and imprecision, subsequently apply suitable soft-computing technique to do approximate reasoning and build computational models capable of learning meaningful patterns from data.
CO4	Create logic programming to build systems capable of making decision to solve real-world problems by applying critical thinking, problem-solving and AI algorithms.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	3	3	3	1	-	-	-	-	-	1	2
CO2	2	3	3	3	1	1	1	1	1	1	1	1
CO3	2	3	3	3	1	-	-	-	-	-	2	2
CO4	2	3	3	3	1	1	1	1	1	1	2	3

Course Overview:
Principles of artificial Intelligence is the simulation of intelligence process by computer systems. It gives understanding of the main abstractions and reasoning techniques used in artificial intelligence including understand of AI, reasoning by machines, planning techniques, and basic machine learning methods.

UNIT I: **[8]**
Introduction to AI, History of Artificial Intelligence, Applications of AI in the real world (Gaming, Computer Vision, Expert Systems, Natural Language Processing, Robotics & others). AI techniques, Problem Solving: Production Systems, State Space Search, Depth First Search, Breadth First Search, Heuristic Search, Hill Climbing, Best First Search, best-first search, A*, Problem Reduction, AO*, Constraint Satisfaction, Means-End Analysis.

UNIT II: **[8]**
Knowledge representation, Knowledge representation using Predicate logic, Propositional logic, Inferences, First-Order Logic, Inferences, Unification, Resolution, Natural Deduction, Procedural versus declarative knowledge, logic programming, forward versus backward reasoning.

UNIT III: **[8]**
Reasoning, Introduction to Uncertainty, Bayesian Theory, Bayesian Network, Dempster-Shafer Theory. Overview of Planning and its Components. Overview of Learning and basic Techniques. Introduction of Fuzzy Reasoning and Neural Networks.

UNIT IV: **[12]**
Game Playing and Current Trends in AI, MinMax search procedure, Alpha-Beta Cutoffs, Game Development using AI, Applications of AI, Emerging Trends in AI Research in various domains.

Text Books:
1. Rich and Knight. Artificial Intelligence, Tata McGraw Hill, 1992.
2. S. Russel and P. Norvig. Artificial Intelligence – A Modern Approach, Second Edition, Pearson Edu.

Reference Books:
1. Kheemani, Deepak, A First Course in Artificial Intelligence, McGraw Hill Education, 1 Edition, 2017.
2. Artificial Intelligence: foundations of computational agents, Cambridge University Press, 2017.
3. Poole, David L., and Alan K. Mackworth. Artificial Intelligence: foundations of computational agents. Cambridge University Press, 2010.
4. Luger, G.F. Artificial Intelligence -Structures and Strategies for Complex Problem Solving, 6th edition, Pearson, 2008.

Semester: 3rd			
Paper code: AIDS257/AIML257/IOT257	**L**	**T/P**	**Credits**
Subject: Principles of Artificial Intelligence Lab	0	**2**	**1**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO EVALUATORS: Maximum Marks: As per university norms

1. This is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under the intimation to the office of the HOD/ Institution in which the appear is being offered from the list of practicals below.
3. Instructors can add any other additional experiments over and above the mentioned in the experiment list which they think is important.
4. At least 8 experiments must be performed by the students.

Course Objectives:

1.	To understand the basics of Prolog Programming.
2.	To solve different mathematical problems using Prolog Programming.
3.	To apply Prolog Programming for solving different real time problems.
4.	To determine the rules for creating Expert Systems.

Course Outcomes:

CO1	Students will be able to understand and apply Prolog Programming for solving different real-life problems.
CO2	Students will be able to create different expert systems using Prolog Programming

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	1	2	1	1	2	2	-	1	1	1	1
CO2	2	1	2	2	1	1	1	1	-	1	1	2

List of Experiments

1. Write a program to implement syntax, basic list manipulation functions and numeric functions in Prolog.
2. Write a program to implement input, output and predicates in Prolog.
3. Write a program to implement local variables and conditional statements using Prolog.
4. Write a program to calculate factorial of a given number using Prolog.
5. Write a program to solve 4-Queen problem using Prolog.
6. Write a program to solve any real-life problem using depth first search.
7. Write a program to solve TIC-TAC-TOE Problem using Prolog.
8. Write a program to solve Monkey Banana Problem using Prolog.

9. Write a program to solve Water Jug Problem using Prolog.
10. Write a program to solve 8 Puzzle Problem using Prolog
11. Write a program to solve Tower of Hanoi Problem using Prolog.
12. Write a program for medical diagnosis using Prolog.

Semester: 3rd			
Paper code: AIDS209/AIML209/IOT209	**L**	**T/P**	**Credits**
Subject: Probability, Statistics and Linear Algebra	**4**	**0**	**4**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Everyunit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	To build a strong foundation on probabilistic and statistical analysis and linear Algebra.
2.	To apply tools of statistics, probability, discrete random variables and probability distributions, in various applications of engineering and technology.
3.	To analyse tools of continuous random variables and probability distributions and linear algebra in various applications of engineering and technology.
4.	To create systems using probabilistic and statistical analysis in varied applications of engineering and science like disease modeling, climate prediction and computer networks etc.

Course Outcomes:

CO1	Understand the fundamentals of probability, Conditional Probability, Baye's theorem, random variables, sampling distribution, mean, and other statistical row reduced echelon form, Solutions of system of linear equations, Vector Space, Basis, Linear Transformations, Eigen values, and Eigen Vectors techniques and apply them to various real-life problems.
CO2	Perform hypothesis testing to analyse various Engineering problems.
CO3	Analyse different distributions, systems of linear equations, and linear transformations in engineering problems.
CO4	Design network models, Markov chain, and their applications.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	2	2	2	1	1	1	1	1	1	1	1
CO2	2	2	2	2	1	1	1	1	1	1	1	1
CO3	2	2	2	2	1	1	1	1	1	1	2	-
CO4	3	2	2	2	-	-	-	-	-	-	2	-

Course Overview:

Probability, statistics and linear algebra gives and allows to access and examine the certainty of outcomes of a study or experiment that is executed. The course also addresses the statistics to gather, review, analyse and draw conclusion from raw data, as well as quantified mathematical models to understand machine learning algorithms.

UNIT I: **[10]**

Probability - Probability spaces, conditional probability, independence; Discrete random variables, continuous random variables and their properties, distribution functions and densities, exponential and gamma densities. Independent random variables, the multinomial distribution, Chebyshev's Inequality, Bayes' rule.

UNIT II: **[10]**

Basic Statistics- Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

UNIT III: **[10]**

Applied Statistics- Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance- large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

UNIT IV: **[10]**

Linear Algebra- Cramer's rule, Singular Value decomposition, Euclidian vector spaces, Projection. Hermitian and Unitary Matrix, Gram -Schmidt orthogonalization, LU-decomposition.

Text Books:

1. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003.
2. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
3. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.

Reference Books:

1. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
3. Veerarajan T. Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.
4. Mathematics For Machine Learning-Marc Peter Deisenroth, A. Aldo Faisal, Cheng soon ong.

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY,
EAST DELHI CAMPUS,
SURAJMAL VIHAR-110092

Semester: 3rd			
Paper code: AIDS211/AIML211/IOT211	**L**	**T/P**	**Credits**
Subject: Universal Human Values II	**3**	**0**	**3**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms
1. There should be 9 questions in the end-term examination question paper 2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. 3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit. 4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.

Course Objectives:	
1.	To expand the holistic perspective based on self-exploration about themselves (human beings), family, society, and nature/existence and to appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and the real meaning of prosperity which are the core aspirations of all human beings.
2.	To understand the harmony in the human being at all four levels- Individual, family, society, and nature/existence.
3.	To strengthen the power of self-reflection with the right understanding.
4.	To develop the right evaluation in terms of actions, reactions, and commitments towards the human goal i.e. mutual happiness and mutual prosperity.
Course Outcomes:	
CO1	Understand and become more aware of self (individual) and our surroundings (family, society, and nature).
CO2	Become more responsible in life for handling problems with sustainable solutions while keeping human relationships and human nature in mind.
CO3	Enhance critical ability for self-reflection.
CO4	Boost sensitivity to our commitment in terms of human values, human relationships, and human society.

CO/PO	**PO01**	**PO02**	**PO03**	**PO04**	**PO05**	**PO06**	**PO07**	**PO08**	**PO09**	**PO10**	**PO11**	**PO12**
CO1	-	-	-	-	-	1	-	3	2	1	-	3
CO2	-	-	-	-	-	1	-	3	2	1	-	3
CO3	-	-	-	-	-	1	-	3	2	1	-	3
CO4	-	-	-	-	-	1	-	3	2	1	-	3

Course Overview:

This course is aimed at giving inputs that will help to ensure the right understanding and right feelings in the students in their life and profession, enabling them to lead ethical life.

In this course, the students learn the process of self-exploration, the difference between the Self and the Body, the naturally acceptable feelings in relationships in a family, the comprehensive human goal in society, the mutual fulfillment in nature, and the co-existence in existence.

UNIT I: **[8]**

Introduction to Value Education - Need, Basic Guidelines, Content and Process for Value Education, Self-Exploration, Natural Acceptance, Experiential Validation as the Mechanism for Self-Exploration. Continuous Happiness and Prosperity, Basic Human Aspirations. Right Understanding, Relationship, and Physical Facilities - the basic requirements for the fulfillment of aspirations of every human being with their priority, Understanding Happiness and Prosperity, Method to fulfill the above human aspirations: Understanding and living in harmony at various levels.

UNIT II: **[8]**

Understanding Harmony in the Human Being, the human being is a Co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of the Self ('I') and 'Body', happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer, and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health, correct appraisal of Physical needs, the meaning of Prosperity, Programs to ensure Sanyam and Health.

UNIT III: **[8]**

Harmony in Human-Human Relationships, Understanding values in human-human relationships, meaning of Justice (Nine universal values in relationships) and the program for its fulfillment to ensure Mutual Happiness, Trust, and Respect as the foundational values of relationship, Understanding the meaning of Trust, Difference between Intention and Competence, Understanding the meaning of Respect, Difference between Respect and Differentiation, the other salient values in a relationship, Understanding the harmony in the society (society being an extension of the family), Resolution, Prosperity, Fearlessness (trust) and Co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society: Undivided Society, Universal order from family to world family.

UNIT IV: **[8]**

Understanding Harmony in Nature. Interconnectedness: Self-regulation and Mutual Fulfillment among the Four Orders of Nature: Recyclability and Self-regulation in Nature, Realizing Existence as Co-existence at All Levels. The Holistic Perception of Harmony in Existence. Natural Acceptance of Human Values. Definitiveness of (Ethical) Human Conduct. A Basis for Humanistic Education, Humanistic Constitution and Universal Humanistic Order.

Text Books:

1. R. R. Gaur, R. Asthana & G. P. Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1. 2. Teacher's 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:

1. A. Nagraj, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak, 1999.
2. A. N. Tripathy, Human Values, New Age International Publishers, 2004.
3. B. L. Bajpai, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
4. P. L. Dhar & R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.

Semester: 3rd			
Paper code: AIDS259/AIML259/IOT259	L	T/P	Credits
Subject: Web Programming Lab	0	2	1
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO EVALUATORS: Maximum Marks: As per university norms	
1. This is only the practical subject. 2. The practical list shall be notified by the teacher in the first week of the class commencement under the intimation to the office of the HOD/ Institution in which the appear is being offered from the list of practicals below. 3. Instructors can add any other additional experiments over and above the mentioned in the experiment list which they think is important. 4. Atleast 8 experiments must be performed by the students.	
Course Objectives:	
1.	To apply JavaScript Language programming concepts and techniques to create web pages and develop, plan and debug web pages as per the requirement. CSS, this course will familiarize students with how browsers
2.	To understand how browsers represent webpage data using the Document Object Model (DOM), how to develop dynamic, interactive web pages using JavaScript in the browser.
Course Outcomes:	
CO1	Apply different core scripting modules to design a server.
CO2	Design and develop single-page applications, interactive and dynamic websites that can be used to resolve real world issues.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	2	2	2	2	-	-	-	-	-	-	2
CO2	2	2	2	2	2	1	1	1	1	1	1	3

LIST OF EXPERIMENTS:

1. Create a web page that covers your CV using various HTML Tags (UL, OL , Table, etc).
2. Create a webpage that displays brief details of various Programming Languages using various types of CSS.
3. Create a webpage using JavaScript and HTML to demonstrate Simple Calculator Application.

4. Create a web page covering the basic CRUD operations (Create, Read, Update, Delete) that implements To-do/Grocery lists using JavaScript and HTML
5. Create a JavaScript application based on various Data Types, Statements, Keywords and Operators.
6. Create a JavaScript application with Window Objects and Document Object.
7. Create a JavaScript application with Object Creation and by adding methods of objects.
8. Create a JavaScript application with Loops to incorporate the concept of Iteration.
9. Create a JavaScript application for random number generation.
10. Build a unit convertor application using HTML & JavaScript.

Semester: 3rd			
Paper code: AIDS213/AIML213/IOT213	**L**	**T/P**	**Credits**
Subject: Critical Reasoning and Systems Thinking	**2**	**0**	**2**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	To inculcate critical reasoning and system thinking to take decisions.
2.	To understand Critical reasoning, examine assumptions, uncover hidden values, evaluate evidence, accomplish actions, and assess conclusions.
3.	To learn a holistic approach to analysis that focuses on the way a system's constituent parts interrelated and how systems work overtime and within the context of larger systems
4.	To formulate solutions for social and business enterprises using critical thinking and brainstorming and covert opportunities into innovation products and services.

Course Outcomes:

CO1	Apply critical reasoning so as to have clarity and wisdom while decision making.
CO2	Apply systems thinking concepts to enhance individual and collaborative skills to recognize opportunities and find innovative solutions for the same.
CO3	Apply and analyse systems thinking, critical thinking, lateral thinking, creative thinking to different real-life scenarios.
CO4	Understand how to translate broadly defined opportunities into innovation products and services and create a business or social enterprise.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	1	1	1	1	-	1	1	3
CO2	2	3	3	3	1	1	-	-	-	-	1	2
CO3	2	3	3	3	1	1	-	1	-	-	1	2
CO4	3	3	3	3	1	1	-	-	1	1	1	3

Course Overview:

This is a perspective course which exposes students to the disciplines of building and evaluating rational arguments and using a system perspective in applied engineering. Critical reasoning and system thinking enhances the though process with reasoning and critical analysis to take to the final decision in order to solve any specific problems. It enables seeing and understanding systems as wholes rather than as collections of parts, as a web of interconnections that work together to deliver an outcome.

UNIT I: **[8]**

Introduction, foundations and principles of critical reasoning, concepts in critical reasoning, analyzing reasoning, evaluating reasoning, Integrated reasoning, uncritical and critical reasoning, scientific reasoning, strategic reasoning, analytical reasoning, different kinds of biases, recognizing implications, drawing conclusion.

UNIT II: **[8]**

Arguments, structure of an argument, premises, claims, Inductive and deductive arguments, valid & invalid arguments, sound & unsound arguments, inductive and deductive arguments, descriptions, explanations, clarifications, illustrations and summary.

UNIT III: **[8]**

What is problem solving, steps in problem solving, problem definition, idea generation, brainstorming, fish bone analysis, thinking out of the box, lateral thinking tools & techniques, Information and data gathering and analysis, evaluating & prioritizing ideas, six thinking hats method, problem solving in teams, planning in teams, Tools and applications in project and risk management, problem solving in teams, planning in teams.

Unit IV: **[8]**

System structures and behavior, Abilene paradox, fallacies in reasoning, barriers in critical thinking, cognition and perception in Indian knowledge systems (Nyaya Darshana), systems thinking, operational and design thinking, system thinking for social change, critical thinking, the art of asking questions, Tools and applications in project and risk management.

Text Books:

1. Concise Guide to Critical Thinking by Lewis Vaughn
2. Critical Thinking by Tom Chatfield
3. Managing Complex Systems - Thinking Outside the Box by Howard Eisner A
4. Critical Thinking Tools for Taking Charge of Your Professional and Personal Life
   By Richard Paul, Linda Elder · 2020

Reference Books:

1. Thinking Fast and Slow by Daniel Kahneman
2. Strategies for creative problem solving by H Scott Fogler and Steven E LeBlanc
3. Critical Thinking A Concise Guide By Tracy Bowell, Gary Kemp · 2002

Semester: 3rd			
Paper code: AIDS215/AIML215/IOT215 (NUES)	**L**	**T/P**	**Credits**
Subject: Selected Readings	1	0	**1**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university norms from time to time

Course Objectives:	
1.	To enhance comprehension skills.
2.	To learn and enhance communication including reading and speaking skills.
Course Outcomes:	
CO1	Apply and analyse comprehension and reading skills.
CO2	Develop presentation and report writing skills.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	1	3	-	3
CO2	1	1	1	1	1	1	1	1	1	3	-	3

Course Overview:

Reading books other than one's curriculum expands the imaginative horizon of a student. Under Selected readings, the students will be required to select a book (a non-technical book that is not related to engineering) that they want to read in the semester. Reading fiction, non-fiction and science books are beneficial for students as it is a vital means to imagine a life other than our own, which in turn makes us more empathetic beings. The students will prepare a summary of the report and will be evaluated based on the presentation that they give on the book read. The whole idea is to present the story in a customized manner. That might also include a video/poster created for the same.

Evaluation Rubrics might be based on:

- Remembering: Recalling or retrieving previously read information.
- Understanding: Comprehending the content and expressing in one's own words.
- Relating and Interpreting: Relating and interpreting the theme or message of the book with a new context or situation.
- Critical Evaluation: Making critical comments about the choice of subject, handling of the subject, author's style of writing, etc.
- Communication Skills: Speaking skills, Report writing, Presentation skills.

Sample Books (not limited to these):

S. No	Title	Authors	Language
1.	Exam Warriors	Narendra Modi	English
2.	Work Ethics	Narendra Modi	English
3.	स्टेफेन हाकिंग	महेश शर्मा	Hindi
4.	Jeff Bezos: Biography of A Billionaire Business Titan	Elliot Reynolds	English
5.	Bill Gates: A Biography	Michael B. Becraft	English
6.	स्टील किंग लक्ष्मी मित्तल	प्रतीक्षा ऍम तिवारी	Hindi
7.	फेसबुक निर्माता: मार्क जुकेरबर्ग	संजय भोला 'धीर	Hindi
8.	Stay हंगरी Stay फुलिश	रश्मि बंसल	Hindi, Gujrati, Tamil
9.	मैं, स्टीव: मेरा जीवन मेरी जुबानी	नीरू	Hindi
10.	अमीर न १ एलन मस्क की बायोग्राफी	पूर्णिमा मजूमदार	Hindi
11.	सुन्दर पिचाई : Google का भविष्य	जगमोहन भानवेरी	Hindi
12.	Dream With Your Eyes Open	Ronnie Screwvala	English
13.	डॉट्स कनेक्ट करें	रश्मि बंसल	Hindi
14.	Take Me Home	Rashmi Bansal	English
15.	Bhujia Barons: The Untold Story of How Haldiram Built A 5000 Crore Empire	Pavitra Kumar	English
16.	The Z Factor: My Journey as The Wrong Man at The Right Time	Subhash Chandra And Pranjal Sharma	English
17.	The Hard Things About Hard Things	Ben Horowitz	English
18.	Blue Ocean Strategy	Harvard Business School	English
19.	Zero to One: Notes on Start Ups, or How to Build the Future	Peter Thiel & Blake Masters	English
20.	The Holy Book of Luck	A Saed Alzein	English
21.	How To Begin	Michael Bungay Stanier	English
22.	Start-up Myths and Models	Rizwan Virk	English
23.	80/20 सिद्धांत - कम के साथ अधिक प्राप्त करने का रहस्य	रिचर्ड कोचो	Hindi
24.	Discover Your Destiny: 7 Stages of Self Awakening	Robin Sharma	English
25.	Hyper Focus	Chris Bailey	English
26.	How To Talk to Anyone	Leil Lowndes	English

27.	Never Split the Difference	Voss, Chris,Raz, Tahl	English
28.	Games People Play	Berne, Eric	English
29.	Achieving Meaningful Success Unleash the Power of Me	Dr. Vivek Mansubgh	English
30.	गेटिंग टू यस	रोजर फिशर	Hindi
31.	Your Next Five Moves	Patrick Bet-David	English
32.	बड़ी सोच का बड़ा जादू	श्वार्ट्ज, डेविड जू	Hindi
33.	How To Become a People Magnet	Marc Reklau	English
34.	सबसे मुश्किल काम सबसे पहले	ब्रायन ट्रेसी	Hindi
35.	Show Your Work	Austin Kleon	English
36.	How To Find Fulfilling Work	Roman Krznaric	English
37.	जीवन के अद्भुत रहस्य	गौर गोपाल दास	Hindi
38.	Attitude Is Everything	Jeff Keller	English
39.	The World is yours to change	Daisaku Ikeda	English
40.	The Defining Decade: Why Your 20's Matter and How the Make the Most of Them Now	Jay, Meg	English
41.	Quiet: The Power of Introvert in A World That Can't Stop Talking	Susan Cain	English
42.	Find Your Why: A Practical Guide for Discovering Purpose You and Your Team	Simon Sinek	English
43.	डीप वर्क	कैल न्यूपोर्ट	Hindi
44.	कैसे करे स्टार्ट उप बिज़नेस शुरू : बिज़नेस का सपना पूरा करने की गाइड	पंकज गोयल	Hindi
45.	Alex Adventure in Number land	Alex Bellos	English
46.	A Certain Ambiguity	Gaurav Suri	English
47.	The Everyday Hero Manifesto	Robin Sharma	English
48.	The Incredible World of Nichiren Buddhism	Suraj Jagtani	English
49.	My Life in Full: Work, Family, And Our Future (With A Special Epilogue for India)	Indra Nooyi	English
50.	India's Greatest Minds: Spiritual Masters, Philosophers, Reformers	Rao, Mukunda	English
51.	Inspiring Thoughts	Swami Vivekananda	English
52.	The Man Behind the Wheel: How Onkar S. Kanwar Created a Global	Tim Bouquet	English

	Giant		
53.	Azim Premji: The Man Beyond the Billions	Sundeep Khanna, Varun Sood	English
54.	Warren Buffett: Inside the Ultimate Money Mind Warren Buffett: Inside the Ultimate Money Mind	Robert G. Hagstrom	English
55.	Rahul Bajaj: An Extraordinary Life | Official Biography of The Chairman of Bajaj Group	Gita Piramal	English
56.	5 Am क्लब: अपनी सुबह का मालिक बनें, अपना जीवन बढ़ाएं	रॉबिन शर्मा	Hindi
57.	Happiness Becomes You: A Guide to Changing Your Life for Good	Tina Turner	English
58.	एटॉमिक हैबिट्स: छोटे बदलाव, असधरन परिनाम	जेम्स क्लियर (लेखक), डॉ सुधीर दीक्षित (अनुवादक)	Hindi
59.	हाउ टू डेवेलोप सेल्फ कॉन्फिडेंस एंड इन्फ्लुएंस पीपल बी पब्लिक स्पीकिंग	डेल कारनेगी	Hindi
60.	धन-संपत्ति का मनोविज्ञान	मॉर्गन हाउसेल	Hindi
61.	रिच डैड पुअर डैड	रॉबर्ट टी. कियोसाकी	Hindi, Bengali
62.	इकिगाई	फ्रांसेस मिरेलस हेक्टर गार्सिया	Hindi, Marathi, Bengali
63.	आपके अवचेतन मन की शक्ति	जोसेफ मर्फी	Hindi, Bengali
64.	सोचा और अमीर हो जाओ	नेपोलियन हिल	Hindi, Bengali
65.	पर्सनालिटी डेवेलोप्मेटन हैंडबुक	डीपी सभरवाल	Hindi
66.	पावर ऑफ़ पॉजिटिव ऐटिटूड	रोजर फ्रिट्ज	Hindi
67.	चिंता छोडो सुख से जियो	डेल कारनेगी	Hindi, Bangla, Marathi, Gujrati & Oria
68.	मुट्ठी में तकदीर	रॉबिन शर्मा	Hindi
69.	जैसे विचार, वैसा जीवन	जेम्स एलन (लेखक), डॉ. सुधीर दीक्षित (अनुवादक)	Hindi
70.	चाणक्य के टॉप 100 प्रेरक विचार	महेश शर्मा	Hindi
71.	'लोक व्यवहार'	डेल कारनेगी	Hindi, Bangla, Marathi, Gujrati & Oria
72.	रहसय	रोंडा बर्न	Hindi
73.	मेमोरी: हाउ टू डेवेलोप, ट्रैन, एंड यूज़ इट	विलियम वॉकर	Hindi

		एटकिंसन	
74.	बड़ा सोचै, बड़ा करै	अंकुर वारिकू	Hindi
75.	द लॉ ऑफ अट्रैक्शन	एस्थर और जेरीहिक्स	Hindi
76.	गोरा	रवींद्र नाथ	Hindi, Bengali
77.	सफलता शब्दों का खेल है	डॉ. सुधीर दीक्षित	Hindi
78.	पॉजिटिव थिंकिंग	नेपोलियन हिल	Hindi
79.	हाउ टू एन्जॉय योर लाइफ एंड जॉब	डेल कारनेगी	Hindi, Bengali
80.	Swami Vivekananda Bani O Rachana (Set) - 10 Volumes – Bengal	Swami Vivekananda	Bengali
81.	The Wisdom of Lotus Sutra	Daisaku Ikeda	English
82.	स्वामी विवेकानंद पुस्तक: जीवन, विचार आणि कार्य	Rajeev Ranjan, Kailas Kalkate	Marathi
83.	विश्वगुरु विवेकानंद	एम. आई. राजसवे	Hindi
84.	बिजनेस कोहिनूर रतन टाटा	बी.सी. पाण्डेय	Hindi
85.	Rattan Tata	P M Tiwari	Bengali
86.	गीतांजलि	रवींद्र नाथ	Hindi, Bengali
87.	सन्यासी जिसने अपनी संपति बीच दी	रॉबिन शर्मा	Hindi
88.	Ignited Minds: Unleashing the Power Within India: Unleashing the Power Within India	Dr APJ Abdul Kalam	English
89.	आपका भविष्य आपके हाथ में	ए पीजे कलाम	Hindi
90.	द स्टोरी ऑफ़ माय एक्सपेरिमेंट्स विथ ट्रुथ	महात्मा गांधी	Hindi
91.	मैं कलाम बोल रहा हूँ	प्रशांत गुप्ता	Hindi
92.	कौन रोयेगा आपकी मृत्यु पर	रॉबिन शर्मा	Hindi
93.	अग्नि की उड़ान	ए पीजे कलाम	Hindi
94.	आनन्द मठ	बंकिमचंद्र चटर्जी	Hindi
95.	The Science of Mind Management	Swami Mukundanadan	English
96.	Soak Education	Daisaku Ikeda	English
97.	7 Mindsets for Success Fulfilment and Happiness	Swami Mukundanadan	English
98.	Business Sutra: A Very Indian Approach to Management	Devdutt Pattanaik	English
99.	The Five Steps to Success	Yandamoori Veerendranath	English
100.	You Are Born to Blossom	Dr APJ Abdul Kalam	English

101.	7 Divine Laws to Awaken Your Best Self	Swami Mukundanadan	English
102.	The Way of Youth	Daisaku Ikeda	English
103.	बेबीलोन का सबसे अमीर आदमी	जॉर्ज एस. क्लैसन	Hindi, Telugu
104.	अमीर होना आपका अधिकारी	जोसेफ मर्फी	Hindi
105.	Buddha: Spirituality for Leadership & Success	Pranay	English
106.	सीक्रेट्स ऑफ़ द मिलियनेअर माइंड	टी. हार्व एकर	Hindi
107.	The Almanack of Naval Ravikant: A Guide to Wealth and Happiness	Eric Jorgenson	English
108.	Ananda: Happiness Without Reason	Achrya Prashant	English
109.	The Awakening of Intelligence (New Edition)	J. Krishnamurti	English
110.	दुनिया का महान सेल्समैन	ओ जी मैंडिनो	Hindi
111.	जिंदगी वो जो आप बनायें	प्रीति शेनॉय	Hindi
112.	The White Tiger	Arvind Adiga	English
113.	Inspirational Thoughts	Swami Vivekananda	English
114.	जीत आपकी: कामयाबी कीऔर ले जाने वाली सीडी	शिव खेरा	Hindi
115.	The God of Small Things	Arundhati Roy	English
116.	Buddhism A Way of Values	Prof. Lokesh Chandra and Dr. Daisaku Ikeda	English
117.	Buddha At Work: Finding Purposes, Balance, And Happiness at Your Workplace	Geetanjali Pandit	English
118.	Hope Is a Decision	Daisaku Ikeda	English

DETAILED SYLLABUS FOR 4th SEMESTER

Semester: 4th			
Paper code: AIDS202/AIML202/IOT202	**L**	**T/P**	**Credits**
Subject: Object Oriented Programming	**3**	**0**	**3**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	To Identify importance of object-oriented programming and difference between structured oriented and object-oriented programming features.
2.	To use various object oriented concepts to solve different problems.
3.	To Learn Java programming Language applying the concepts of object-oriented programming language.
4.	To design and implement programs for complex problems, making good use of the features of the language such as classes, inheritance, polymorphism.

Course Outcomes:

CO1	Ability to understand the concepts of object oriented programming i.e. abstract datatypes, encapsulation, inheritance, polymorphism.
CO2	Identify classes, objects, members of a class and relationships among them needed for resolving real world problems.
CO3	Ability to analyse a problem to develop algorithm with suitable logics and concepts of OOPs for solving real world problems.
CO4	Ability to create application or programs using OOP principles and proper program structuring.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	3	3	3	1	-	-	-	-	-	-	-
CO2	2	3	3	3	1	1	1	-	1	1	1	-
CO3	2	3	3	3	1	-	-	-	-	-	-	3
CO4	2	3	3	3	1	1	1	1	1	1	1	1

Course Overview:

This course provides an introduction to object oriented programming (OOP) using the Java programming language. This course will provide the students with a solid theoretical understanding of, as well as practical skills. Its main objective is to teach the basic concepts and techniques which form the object-oriented programming paradigm. It aims to design solutions for the complex problems.

UNIT I: **[8]**

Introduction of Object-Oriented Programming, Benefits of Object Oriented Development, Classes and Objects, Inheritance, Polymorphism, Object- Oriented Design. Overview & characteristics of Java, Program Compilation, Execution Process Organization of the Java Virtual Machine and security aspects, sandbox model.

UNIT II: **[8]**

Java Fundamentals, Data Types & Literals Variables, Wrapper Classes, Arrays, Arithmetic Operators, Logical Operators, Control of Flow, Loops, Classes and Instances, Class Member Modifiers Anonymous Inner Class Interfaces and Abstract Classes, Inheritance using java, Exception Handling. Collection API Interfaces, Vector, stack, Hashtable, enumeration, set, List, Map, Iterators.

UNIT III: **[8]**

Multithreading- Extending Thread Class, Runnable Interface, Starting Threads, Thread Synchronization. GUI components in Java: AWT Components, Component Class, Container Class, Layout Managers, swing package. Event Handling: AWT Events, Event, Listeners, Class Listener, Action Event Methods, Focus Event Key Event, Mouse Event, Window Event Adapters.

UNIT IV: **[8]**

Java I/O: Input/Output Streams, Readers and Writers. JDBC (Database connectivity with MS-Access, Oracle, MS-SQL Server), Object serialization, Socket Programming, development of client Server applications, Design of multithreaded server.

Text Books:

1. Patrick Naughton and Herbertz Schidt. Java-2 the complete Reference, TMH.
2. Sierra & bates. Head First Java, O"Reilly.

Reference Books:

1. E. Balaguruswamy. Programming with Java, TMH.
2. Horstmann. Computing Concepts with Java 2 Essentials, John Wiley.
3. Decker & Hirshfield. Programming. Java, Vikas Publication.

Semester: 4th			
Paper code: AIDS252/AIML252/IOT252	**L**	**P**	**Credits**
Subject: Object-Oriented Programming Lab	**0**	**2**	**1**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO EVALUATORS: Maximum Marks: As per university norms	
1. This is the practical component of the corresponding theory paper. 2. The practical list shall be notified by the teacher in the first week of the class commencement under the intimation to the office of the HOD/ Institution in which the appear is being offered from the list of practicals below. 3. Instructors can add any other additional experiments over and above the mentioned in the experiment list which they think is important. 4. At least 8 experiments must be performed by the students.	
Course Objectives:	
1.	To implement real-world entities like inheritance, hiding, polymorphism, etc in developing software applications.
2.	To understand how binding together the data and the methods operating on them helps in developing the applications.
Course Outcomes:	
CO1	Apply object-oriented principles to design programming solutions to actual problems.
CO2	Analyse different packages of object-oriented programming language.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	2	2	2	1	1	1	2	1	1	1	3
CO2	2	2	2	2	1	-	-	-	-	-	-	-

LIST OF EXPERIMENTS:

1. Generate a random number up to 100 and print whether it is prime or not.

2. A. Design a program to generate first 10 terms of Fibonacci series.

   B. Find the factorial of a given number using Recursion.

3. Find the average and sum of array of N numbers entered by user.

4. Create a class to find out the Area and perimeter of rectangle.

5. Design a class that perform String operations (Equal, Reverse the string, change case).

6. Demonstrate the use of final keyword with data member, function and class.

7. Demonstrate the use of keywords try, catch, finally, throw and throws.

8. Design a program to demonstrate multi-threading using Thread Class.
9. Design a program to create game ‘Tic Tac Toe’.
10. Design a program to basic calculator using Applet and Event Handling.
11. Design a program to read a text file and after printing that on scree write the content to another text file.
12. Design a program to count number of words, characters, vowels in a text file.
13. Design a program to create simple chat application using Socket Programming.
14. Design a program to connect to access database and display contents of the table.

Semester: 4th			
Paper code: AIDS204/AIML204/IOT204	**L**	**T/P**	**Credits**
Subject: Database Management Systems	**3**	**0**	**3**

Marking Scheme

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Everyunit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	To introduce the concepts of databases, database models, and their uses.
2.	To assess the need for Database design to create a strong foundation for application.
3.	To understand the various complications & its solution for Transaction management.
4.	To understand advanced data bases and its application.

Course Outcomes:

CO1	Understand the principles of Database Management Systems.
CO2	Apply Structured Query Language to a varied range of queries and work on database using state of art tools.
CO3	Analyse various techniques and various models used for designing databases for different real-life situations.
CO4	Investigate normalized database schema and prepare a report for a real-life scenario.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	3	2	2	1	-	-	-	-	-	1	2
CO2	2	3	2	2	3	-	-	-	-	-	1	1
CO3	2	3	3	2	1	1	1	1	1	1	1	3
CO4	2	3	2	2	1	-	-	-	-	-	1	3

Course Overview:

The objective of the course is to present an introduction to database management systems with advanced topics of DBMS, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from databases. It includes Entity-Relational model, Normalization, Relational model, Relational algebra, and data access queries as well as an Introduction to SQL, MongoDB.

UNIT I: **[8]**

Introduction-Overview of Database System and various Data Models (Hierarchical, Network, and Relational Models), Views of Data, Comparison of Database Management System with File System, Architecture of DBMS, components of DBMS. Data Independence. Entity-Relationship Model- Entities, Entity Types, Attributes, Relationships, Relationship types, E/R diagram notation, Conversion of E/R diagram to relations.

UNIT II: **[8]**

Relational Data Model- Concept of Relations, Overview of Various Keys, Referential Integrity, and foreign keys. Relational Language- Relational Algebra, Tuple and Domain Relational Calculus, SQL, DDL and DML, Introduction and basic concepts of PL/SQL (Cursors, Procedures, Triggers). Basic steps in Query Processing and Optimization.

UNIT III: **[8]**

Database Design- Dependencies and Normal forms, Functional Dependencies, 1NF, 2NF, 3NF, and BCNF. Higher Normal Forms-4NF and 5NF. Transaction Management: ACID properties, Serializability, Concurrency Control (2PL, Timestamp protocol), Database recovery management – Log based recovery, checkpoints.

UNIT IV: **[8]**

Advanced Topics- CAP Theorem, Data Storage and Indexes, Hashing Techniques, NOSql, Types of NOSql databases, MongoDB: Introduction, History of MongoDB, Installation and configuration. Key Features. Core servers & tools. Basic commands, Comparison of relational databases to MongoDB, Cassendra, HBASE, etc.

Text Books:

1. Silberschatz, A., Korth, Henry F., and Sudharshan, S., Database System Concepts, 5th Edition, Tata McGraw Hill, 2016.
2. Elmasri, Ramez and Navathe, Shamkant B., Fundamentals of Database Systems 7th Edition, Pearson, 2015.

Reference Books:

1. Date, C. J, Kannan, A. and Swamynathan, S., An Introduction to Database Systems, 8th edition, Pearson Education, 2012.
2. J. D. Ullman, Principles of Database Systems, 2nd Ed., Galgotia Publications, 1999.

3. Vipin C. Desai, An Introduction to Database Systems, West Publishing Co.

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SURAJMAL VIHAR-110092

Semester: 4th			
Paper code: AIDS254/AIML254/IOT254	**L**	**T/P**	**Credits**
Subject: Database Management System Lab	**0**	**2**	**1**

Marking Scheme

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO EVALUATORS: Maximum Marks: As per university norms

1. This is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under the intimation to the office of the HOD/ Institution in which the appear is being offered from the list of practicals below.
3. Instructors can add any other additional experiments over and above the mentioned in the experiment list which they think is important.
4. At least 8 experiments must be performed by the students.

Course Objectives:

1.	To create a database as per the proper rules.
2.	To organize, maintain and efficiently, and effectively retrieve information from a database.

Course Outcomes:

CO1	Apply Database management principles to fetch and maintain details efficiently and effectively from the databases of the real world.
CO2	Use the basics of SQL, MongoDB commands and construct queries using in database creation and interaction.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	3	3	2	2	1	1	1	1	1	1	2
CO2	2	3	3	2	3	-	-	-	-	-	-	2

LIST OF EXPERIMENTS:

1. Study and practice various database management systems like MySQL/Oracle/PostgreSQL/SQL Server and others.
2. Implement simple queries of DDL and DML.
3. Implement basic queries to Create, Insert, Update, Delete and Select Statements for two different scenarios (For instance: Bank, College etc.)
4. Implement queries including various functions- mathematical, string, date etc.
5. Implement queries including Sorting, Grouping and Subqueries- like any, all, exists, not exists.
6. Implement queries including various Set operations (Union, Intersection, Except etc.).
7. Implement various JOIN operations- (Inner, Outer).

8. Write a PL/SQL program using FOR loop to insert ten rows into a database table.
9. Given the table EMPLOYEE (Emp No, Name, Salary, Designation, DeptID), write a cursor to select the five highest-paid employees from the table.
10. Illustrate how you can embed PL/SQL in a high-level host language such as C/Java And demonstrates how a banking debit transaction might be done.

The students should be motivated to make a project using MySql and MongoDb.

Semester: 4th			
Paper code: AIDS206/AIML206/IOT206	**L**	**T/P**	**Credits**
Subject: Software Engineering	**3**	**0**	**3**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Everyunit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	To familiarize students with basic Software engineering methods and practices and their applications.
2.	To explain layered technology in software engineering
3.	To teach software metrics and software risks.
4.	To familiarize students with software requirements and the SRS documents.
5.	To facilitate students in software design.

Course Outcomes:

CO1	Understand software systems of the real world and their life cycle.
CO2	Design the software solutions per the SRS requirement and proper tools.
CO3	Estimate software development cost and its maintenance.
CO4	Deploy various testing techniques to test software.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	2	2	2	3	1	1	1	1	1	1	2
CO2	2	2	2	2	3	-	-	-	-	-	1	2
CO3	2	2	2	2	3	-	-	-	-	-	1	2
CO4	3	2	2	2	3	-	-	-	-	-	1	2

Course Overview:

Software Engineering comprises the core principles consistent in software construction and maintenance: fundamental software processes and life cycles, mathematical foundations of software engineering, requirements analysis, software engineering methodologies, and standard notations, principles of software architecture and re-use, software quality frameworks and validation, software development, and maintenance environments and tools. It's an introduction to the object-oriented software development process and design.

UNIT I: **[8]**

Introduction to Software- Nature of Software, Introduction to Software Engineering, Software Engineering Layers, Software Myths, The Software Processes, Project, Product, Process Models: A Generic Process Model, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Spiral Model. COCOMO Model. UML diagrams -Sequential, Class Diagram, Activity Diagram, Component Diagram, Use-Case Diagram, State Machine Diagram.

UNIT II: **[8]**

Requirements Engineering- Functional and Non-Functional Requirements, The Software Requirements Document, Requirements Specification, Requirements Engineering, Requirements Elicitation and Analysis, Requirement Validation, Requirement Management, DFD, Data Dictionary. Introduction to ER diagrams

UNIT III: **[8]**

Software Design- Design concepts and principles - Abstraction - Refinement - Modularity Cohesion coupling, Architectural design, Detailed Design Transaction Transformation, Refactoring of designs, Object-oriented Design User-Interface Design. Software Testing: White-Box Testing, Black Box Testing. Stress Testing. Alpha, Beta, and Acceptance Testing. Debugging.

UNIT IV: **[8]**

Software Maintenance and Management- Software Maintenance, Types of Maintenance, Software Configuration Management, Overview of RE-engineering Reverse Engineering, Reliability: Failure and Faults, Reliability Models. Quality and Risk Management: Product Metrics, Software Measurements, Metrics for Software Quality, Risk Management: Software Risks, Risk Identification, Risk Projection, Risk Refinements, Risk Mitigation Monitoring and Management (RMMM). Overview Of Quality Management. CMM, ISO 9000, and Six Sigma.

Text Books:

1. Roger S. Pressman (2011), Software Engineering, A Practitioner's Approach, 7th edition, McGraw Hill International Edition, New Delhi.
2. Sommerville (2001), Software Engineering, 9th edition, Pearson Education, India.

References:

1. K. K. Aggarwal, Yogesh Singh (2007), Software Engineering, 3rd edition, New Age International Publishers, India.
2. Lames F. Peters, Witold Pedrycz (2000), Software Engineering an Engineering approach, John Wiley & Sons, New Delhi, India.
3. Shely Cashman Rosenblatt (2006), Systems Analysis and Design, 6th edition, Thomson Publications, India

Semester: 4th			
Paper code: AIDS208/AIML208/IOT208	**L**	**T/P**	**Credits**
Subject: Computer Networks and Internet Protocol	**3**	**0**	**3**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	To implement a simple LAN with hubs, bridges and switches.
2.	To describe how computer networks are organized with the concept of layered approach.
3.	To demonstrate internet protocols using the modern tools of computer networks.
4.	To design and implement a network for an organization.

Course Outcomes:

CO1	Understand concepts of computer networks and various Internet protocols.
CO2	Analyse given data segments/packets/frames and protocols in various layers of computer networks.
CO3	Design real networks using state of art components using simulation tools.
CO4:	Design and implement a network for an organization.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	2	2	2	2	-	-	-	-	-	-	1
CO2	2	2	2	2	2	-	-	-	-	-	-	-
CO3	2	2	2	2	3	-	-	-	-	-	-	-
CO4	2	2	2	2	2	1	1	1	1	1	1	2

Course Overview:

This course deals with fundamentals of computer networks and Internet protocols. It addresses various network models, Data link protocols, network layer protocols and implementation of computer network models and OSI layers. The course also deals with Transport layer protocols. The main emphasis of this course is on the organization and management of networks and internet protocols.

UNIT I: **[8]**

Introduction to Layered Network Architecture- What are computer networks, Layered models for networking, different types of communication models, ISO-OSI Model, TCP/IP.

UNIT II: **[8]**

Data Link Protocols- Stop and Wait protocols, Noise-free and Noisy Channels, Performance and Efficiency, Sliding Window protocols, MAC Sublayer: The Channel Allocation Problem, Carrier Sense Multiple Access Protocols, Collision Free Protocols, FDDI protocol. IEEE Standard 802.3 & 802. 11 for LANs and WLANs

UNIT III: **[8]**

Network Layer protocols- Design Issues: Virtual Circuits and Datagrams, Routing Algorithms, Optimality principle, shortest path routing Algorithms, Flooding and Broadcasting, Distance Vector Routing, Link State Routing, Flow-Based Routing, Multicast Routing; Flow and Congestion Control.

UNIT IV: **[8]**

Transport Layer Protocols- Design Issues, Quality of Services. The Internet Transport Protocols. IPV4 vs IPV6. Session Layer protocol: Dialog Management, Synchronization, Connection Establishment. Quality of service, security management, Firewalls. Application layer protocols: HTTP, SMTP, FTP, SNMP, etc.

Text Books:

1. Tanenbaum, S., C*omputer Networks, Fifth Edition*, Prentice Hall, India, 2013.
2. Behrouz A. Forouzan, Data communication and networking, 5E, Tata McGraw Hill, 2013.

Reference Book:

1. Computer networking- A top-down approach, Pearson Publications. 2017 edition.

Semester: 4th			
Paper code: AIDS256/AIML256/IOT256	**L**	**P**	**Credits**
Subject: Computer Networks and Internet Protocol Lab	**0**	**2**	**1**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO EVALUATORS: Maximum Marks: As per university norms

1. This is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under the intimation to the office of the HOD/ Institution in which the appear is being offered from the list of practicals below.
3. Instructors can add any other additional experiments over and above the mentioned in the experiment list which they think is important.
4. At least 8 experiments must be performed by the students.

Course Objectives:

1.	To analyse various computer network protocols and components of computer network.
2.	To design and evaluate the challenges in building networks and as per the requirement of an organization.

Course Outcomes:

CO1	Design and analyse network protocols using state of art simulation tools.
CO2	Design, analyse and evaluate network services for homes, data centres, IoT, LANs and WANs.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	2	2	2	3	-	-	-	-	1	-	-
CO2	2	3	3	2	2	1	1	1	2	1	1	2

LIST OF EXPERIMENTS:

1. Introduction to basic networking tools: Wireshark and Network Miner.
2. Introduction to Datadog tool for data monitoring in network.
3. Running and using services/commands like ping, trace, route, nslookup, arp, ftp etc.
4. Introduction to Network Bandwidth analyser tool for network monitoring.
5. Implementation of Packet Capture and observations using packet Sniffer.
6. Explore various aspects of HTTP Protocol.
7. Tracing DNS with Wireshark.
8. Analyzing various parameters for TCP protocol in action.
9. Create Ring, Bus, Star and Mesh topology using Cisco Packet Tracer.
10. Configure a network using distance vector routing and link state vector routing protocol.

11. Implement Dijkstra's shortest path algorithm in network routing.

Semester: 4th			
Paper code: AIDS210/AIML210	L	T/P	Credits
Subject: Fundamentals of Machine Learning	3	0	3
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms
1. There should be 9 questions in the end term examination question paper 2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. 3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Everyunit should have two questions. However, students may be asked to attempt only 1 question from each unit. 4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks. 5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:	
1.	To understand regression, classification and prediction algorithms to classify data.
2.	To gain knowledge about feature selection.
3.	To analyse feature engineering techniques to formulate the solutions for the complex problems
4.	To apply machine learning techniques in real world problems.

Course Outcomes:	
CO1	Understand machine learning tools and techniques with their applications.
CO2	Apply machine learning techniques for classification and regression.
CO3	Perform feature engineering techniques.
CO4	Design supervised and unsupervised machine learning based solutions for real-world problems.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	3	1	1	1	1	1	1	2
CO2	3	3	3	3	2	1	1	1	1	1	1	1
CO3	3	3	3	3	2	-	-	-	-	-	-	-
CO4	3	3	3	3	2	1	1	1	1	1	1	2

Course Overview:

This course covers fundamental concepts and methods of computational data analysis, including pattern classification, prediction, visualization, and recent topics in machine learning. The course will give the student the basic ideas and intuition behind modern machine learning methods as well as a bit more formal understanding of how, why, and when they work. The underlying theme in the course is a statistical inference as it provides the foundation for most of the methods covered.

UNIT I: **[8]**

Introduction to Machine Learning- Basic concepts, developing a learning system, Learning Issues, and challenges. Types of Machine Learning. Feature Selection Mechanisms, Imbalanced Data, Bias in Data, Outlier Detection

UNIT II: **[8]**

Supervised Learning- Linear Regression, Multiple Regression, Logistic Regression, Classification; Classifier Models, K Nearest Neighbor (KNN), Naive Bayes, Decision Trees, Support Vector Machine (SVM), Random Forest

UNIT III: **[8]**

Unsupervised Learning- Dimensionality Reduction; Clustering; K-Means Clustering; C-Means Clustering; Fuzzy C Means Clustering, Association Analysis- Association Rules in Large Databases, Apriori Algorithm, Markov Models: Hidden Markov Models (HMMs).

UNIT IV: **[8]**

Reinforcement Learning- Introduction to Reinforcement Learning, Elements of Reinforcement Learning, Approaches to Reinforcement Learning, Applications of Reinforcement learning. Applications of Machine Learning in different sectors: Medical Diagnostics, Fraud Detection, Email Spam Detection

Text Books:

1. Tom M. Mitchell, Machine Learning, McGraw-Hill, 2010.
2. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, Pearson, Third Edition, 2014.
3. Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995

Reference Books:

1. Ethem Alpaydin, (2004), Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press
2. T. Astie, R. Tibshirani, J. H. Friedman, The Elements of Statistical Learning, Springer (2nd ed.), 2009
3. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag

Semester: 4th			
Paper code: AIDS258/AIML258	**L**	**P**	**Credits**
Subject: Fundamentals of Machine Learning Lab	**0**	**2**	**1**
Marking Scheme			

3. Teachers Continuous Evaluation: As per university examination norms from time to time
4. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO EVALUATORS: Maximum Marks: As per university norms

1. This is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under the intimation to the office of the HOD/ Institution in which the appear is being offered from the list of practicals below.
3. Instructors can add any other additional experiments over and above the mentioned in the experiment list which they think is important.
4. At least 8 experiments must be performed by the students.

Course Objectives:

3.	To formulate and analyse algorithm based on machine learning.
4.	To design the use cases of machine learning algorithms as per the user requirement.

Course Outcomes:

CO1	Apply and differentiate machine learning algorithms for regression, classification and prediction problems.
CO2	Implement supervised and unsupervised machine learning models to analyse data for executing feature engineering and feature selection for real-life scenarios.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	3	1	1	1	1	1	1	2
CO2	3	3	3	3	3	1	1	1	1	1	2	1

LIST OF EXPERIMENTS:

1. Study and Implement Linear Regression.
2. Study and Implement Logistic Regression.
3. Study and Implement K Nearest Neighbour (KNN).
4. Study and Implement classification using SVM.
5. Study and Implement Bagging using Random Forests.
6. Study and Implement Naive Bayes.
7. Study and Implement Decision Trees.
8. Study and Implement K-means Clustering to Find Natural Patterns in Data.
9. Study and Implement Gaussian Mixture Model Using the Expectation Maximization.
10. Study and Implement Classification based on association rules.
11. Study and Implement Evaluating ML algorithm with balanced and unbalanced datasets.
12. Comparison of Machine learning algorithms based on different-different parameters.

Semester: 4th			
Paper code: IOT210	**L**	**T/P**	**Credits**
Subject: Internet of Things	**3**	**0**	**3**

Marking Scheme

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	To learn fundamentals of IoT and how to build IoT based systems.
2.	To emphasize on development of Industrial IoT applications.

Course Outcomes:

CO1	Ability to understand design flow of IoT based systems.
CO2	Analyse and understand different communication protocols for connecting IoT nodes to server.
CO3	Apply design concept to IoT solutions.
CO4	Develop the state-of-the-art IoT based systems, suitable for real life and Industry applications.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	-	-	2	2	2	-	1	1	-	-	1	1
CO2	-	-	2	2	2	-	1	-	-	-	1	1
CO3	-	-	2	2	2	-	1	-	-	-	1	1
CO4	1	1	3	2	2	1	1	1	1	1	1	1

Course Overview:

The course enables student to understand the basics of Internet of things and protocols. It introduces some of the application areas where Internet of Things can be applied. Students will learn about the middleware for Internet of Things. The course addresses various components of Internet of things such as Sensors, internetworking, protocols. In the end students will also be able to design and implement IoT circuits and solutions.

UNIT I: **[8]**

The Internet of Things: An Overview of what is IoT? Why IoT? Explain the definition and usage of the term "Internet of Things (IOT)" in different contexts. Design Principles for Connected Devices, internet principles: internet communications-An overview, Physical Design of IoT, Logical Design of IoT, IoT standards, IoT generic architecture and IoT protocols. IoT future trends, Understand IoT Applications and Examples. Understand various IoT architectures based on applications. Understand different classes of sensors and actuators. Sensors: sensor terminology, sensor dynamics and specifications. Understand the basics of hardware design needed to build useful circuits using basic sensors and actuators.

UNIT II: **[8]**

Network protocols: Understand various network protocols used in IoT, Understand various communication protocols (SPI, I2C, UART).

Arduino Code and building circuits: Design and develop Arduino code needed to communicate the microcontroller with sensors and actuators, build circuits using IoT supported Hardware platforms such as Arduino, ESP8266 etc., Use of software libraries with an Arduino sketch that allows a programmer to use complicated hardware without dealing with complexity, Learning IoT application programming and build solutions for real life problems and test them in Arduino and Node MCU environments. Understand various wireless Technologies for IoT and its range, frequency and applications.

UNIT III: **[8]**

Importance of IEEE 802.15.4 MAC and PHY layer: Importance of IEEE 802.15.4 MAC and IEEE 802.15.4 PHY layer in constrained networks and their header format, Importance of Zigbee technology and its applications, use of IPv6 in IoT Environments, Understanding importance of IPv6 and how constrained nodes deal with bigger headers (IPv6). Understand IPv6 over Low-Power WPAN (6LoWPAN) and role of 6LoWPAN in wireless sensor network. Various routing techniques in constrained network. Understanding IoT Application Layer Protocols, HTTP, CoAP Message Queuing Telemetry Transport (MeTT).

UNIT IV: **[8]**

Role of big data, cloud computing and data analytics: Role of big data, cloud computing and data analytics in a typical IoT system. Analyze various case studies implementing IoT in real world environment and find out the solutions of various deployment issues. Smart parking system, Smart irrigation system-block diagram, sensors, modules on Arduino and Node MCU.

Text Books

1. "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of things" by David Hanes, Cisco Press.
2. Internet of things with ESP 8266, Macro Schwartz, Pact publication.
3. Bahga, A., & Madisetti, V. (2014). Internet of Things: A hands-on approach. Vpt.
4. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013

Reference Books:

1. Building the Internet of Things with IPv6 and MIPv6 The Evolving World of M2M Communications, Daniel Minoli, Wiley Publications.
2. Mastering internet of things by Peter Waher, Pact publication.
3. The Internet of Things: connecting objects to the web, Hakima chaouchi, Wiley Publications.
4. Course Era: "Interfacing with the Arduino" by Ian Harris, University of Irvine, California.

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY,
EAST DELHI CAMPUS,
SURAJMAL VIHAR-110092

Semester: 4th			
Paper code: IOT258	**L**	**P**	**Credits**
Subject: Internet of Things Lab	**0**	**2**	**1**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO EVALUATORS: Maximum Marks: As per university norms
1. This is the practical component of the corresponding theory paper. 2. The practical list shall be notified by the teacher in the first week of the class commencement under the intimation to the office of the HOD/ Institution in which the appear is being offered from the list of practicals below. 3. Instructors can add any other additional experiments over and above the mentioned in the experiment list which they think is important. 4. At least 8 experiments must be performed by the students.

Course Objectives:	
1.	To teach students how to analyse different protocols, simulation platforms and applications of IoT
2.	To design IoT systems and applications to solve real time problems.

Course Outcomes:	
CO1	Apply IoT principles to design programs using a software and hardware to using variety of available resources to create IoT ecosystem
CO2	Implement applications based on IoT for solving different problems using Arduino or Raspberry PI boards.

CO/PO	**PO01**	**PO02**	**PO03**	**PO04**	**PO05**	**PO06**	**PO07**	**PO08**	**PO09**	**PO10**	**PO11**	**PO12**
CO1	1	1	2	2	2	-	1	1	-	-	1	1
CO2	1	1	2	2	3	1	1	1	1	1	1	1

LIST OF EXPERIMENTS:

1. Introduction to Arduino platform and programming and Introduction to various sensors and various actuators & its applications.
2. Introduction with running a blinking LED and fading LED with PWM.
3. **A.** Arduino IDE and Operators in IDE.
   B. Frequently used Functions in Arduino IDE.
4. Control Structure writing programs for if else, for and While.
5. Custom functions that can be created for specific Needs.

6. Reading and writing digital and analog values. Digital and analog read/write demonstration.
7. Measuring light with Lux and a photoresistor demonstration
8. Measuring temperature and humidity.
9. Adding an LCD screen and sketch walkthrough.
10. Create an echo server with the Ethernet Shield over Arduino.
11. Upload data from a single sensor to ThingSpeak using ESP8266 (NodeMCU).
12. Upload data from multiple sensors to ThingSpeak using ESP8266 (NodeMCU).
13. Setting up logging and visualizing data on ThingSpeak.
14. Making Project- on real-world Problems.

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY,
EAST DELHI CAMPUS,
SURAJMAL VIHAR-110092

Semester: 4th			
Paper code: AIDS212/AIML212/IOT212	**L**	**T/P**	**Credits**
Subject: Computational Methods	**3**	**0**	**3**

Marking Scheme

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Everyunit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	To develop a practical approach to mathematical problem solving.
2.	To introduce many commonly used tools and techniques in numerical work.
3.	To convert algorithms and techniques to working computer codes.
4.	To understand the nuances of the numerical techniques and computer applications of the same.

Course Outcomes:

CO1	Ability to understand numerical techniques to find the roots of non-linear equations and solution of system of linear equations.
CO2	Ability to understand the solution of the linear simultaneous equations using iterative methods and apply them to real world applications.
CO3	Ability to understand numerical differentiation and integration and numerical solutions of ordinary and partial differential equations.
CO4	Ability to understand numerical methods to solve the ordinary differential equation and partial differential equation.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	2	2	3	-	-	-	-	-	-	-	-
CO2	3	2	3	3	1	1	1	1	1	1	1	1
CO3	3	2	3	3	-	-	-	-	-	-	-	-
CO4	3	2	3	3	-	-	-	-	-	-	-	-

Course Overview:

The Computational Methods course equips students with essential techniques for solving complex problems in various domains using computers. Students will learn numerical methods, algorithms, and data structures to perform simulations, optimization, and data analysis. The course covers topics such as numerical integration, root finding, linear algebra, and optimization algorithms. Practical implementation using programming languages and software tools will be emphasized, enhancing problem-solving skills. By the end, students will have a solid foundation in computational methods to tackle real-world challenges and support advancements in science, engineering, and technology.

UNIT I: **[8]**

Numerical solution to Linear algebraic & transcendental equations- Numerical algorithms and their complexities, Computer implementation and efficiency, Root finding- bracketing methods: Bracketing Methods, graphical methods, Bisection method, False Position (Regula Falsi), Root finding -Open Methods: Simple Fixed-Point Iteration, Newton-Raphson method, Secant methods, Brent's method

UNIT II: **[8]**

Numerical linear algebra- Gauss elimination, Pivoting, Tridiagonal systems, LU factorization, Gauss elimination as LU factorization, Cholesky factorization, Matrix inverse and condition, Error analysis and system condition. Iterative Methods: Gauss-Seidel method, Nonlinear Systems. Eigenvalues: The Power Method, Interpolations: Newton and Gauss formulas, Stirling and Bessel Formula, Lagrange's, piecewise/splines

UNIT III: **[8]**

Numerical Differentiation- High-Accuracy differentiation formulas, Richardson Extrapolation, Derivatives of unequally spaced data, Partial Derivatives. Numerical Integration: Newton-Cotes Formulas, The trapezoidal rule, Simpson’s Rules, Higher-Order Newton-Cotes formula, Romberg integration, Gauss quadrature, Adaptive quadrature

UNIT IV: **[8]**

Ordinary differential equations- Euler's Method, Runge-Kutta Methods, Adaptive methods, finite difference methods, Initial value problems, Boundary value problems, Partial differential equations.

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

2. Numerical Methods for Engineers, Steven Chapra, Raymond Canale, McGraw-Hill Higher Education, 2010

Reference Books:

1.Numerical Methods in Engineering & Science (with Programs in C,C++ & MATLAB), B. S. Grewal, Khanna Publishers.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

Semester: 4th			
Paper code: AIDS214/AIML214/IOT214 (NUES)	**L**	**T/P**	**Credits**
Subject: Effective Technical Writing	**1**	**0**	**1**
Marking Scheme			

1. Teachers Continuous Evaluation: 100

Note: Submission of Research Paper will be an evaluation parameter for the completion of course. (100 marks)	
Course Objectives:	
1.	To understand the fundamentals of effective technical writing.
2.	To develop the skill of preparing logical and persuasive technical papers/proposals/ reports.
3.	To apply standard technical formats for drafting protocol and research papers.
4.	To inculcate habits of effective technical writing applying precision, conciseness, and ucidity.
Course Outcomes:	
CO1	The concepts of effective technical writing
CO2	Apply precision, conciseness and lucidity while writing
CO3	Demonstrate by writing a technical paper/article by using global standard formats.
CO4	Develop skills to gather, evaluate, and synthesize technical information from various sources, including interviews, surveys, technical documents, and online resources.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	-	-	-	-	2	-	-	-	1	3	-	2
CO2	-	-	-	-	2	-	-	-	1	3	-	2
CO3	1	1	1	1	2	1	1	1	1	3	1	2
CO4	1	2	1	1	3	1	1	1	1	3	1	2

Course Overview: -

Under Effective Technical Writing, students are expected to understand the process of writing technical research papers/ articles. The students are required to take up a topic of their choice and write a research paper/ article on the same using state-of-art document preparation software like Latex, overleaf, etc. Students must be familiar with all primary international template styles of a research paper like IEEE, Springer, ACM, etc. Students will also be taught various referencing formats (for example: APA). Research paper/ article writing is a must-have skill for future scientists & researchers, and it opens up their domain of knowledge. The research paper/article/proposal submitted by students will be checked

for plagiarism. This will lead to the development of skills including proper paper format, proper referencing, inclusion of figures, tables, use of keywords, writing abstract, title etc.

Unit-I **[No. of Hours: 6]**

Introduction to Technical Writing: Basics and guidelines of technical writing, Layout of research/review paper, Finalization of Problem Statement, Collection of Primary and Secondary data. Processing and analysing the data. Relevance of Literature Review, Objectives of Literature Review, Sources of Literature, References, How to Conduct the Review of Literature, Precautions in Library Use, Reporting the Review of Literature. Title finalization, Abstract formulation, keywords. Citations format: APA, Harvard, Chicago, Vancouver. Proper way of writing and citing equations, Proper use of figures and tables, Writing a good review paper.

Unit-II **[No. of Hours: 6]**

Introduction to Latex: Installation of Latex software, Basics of overleaf, basic syntax, writing equations, tables, inserting figures. Page layout- Title, Abstract, Chapters, Sections, References, Equation references, Citations. Preparation of table and contents, Figure handling numbering, generating index, Creating ordered and unordered list. Packages: Geometry, maths, algorithms.

Introduction to various International template styles- IEEE, Springer, ACM, etc. Indexing- Clarivate, Scopus, Web of Science, etc.

Unit-III **[No. of Hours: 2]**

Ethics and Plagiarism: Seeking consent, ethical committees (human & animal), Ethical issues to consider relating to the researcher, IPR- intellectual property rights and patent law, commercialization, scholarly publishing, citation and acknowledgement, plagiarism, reproducibility and accountability.

Concluding the Research Paper: Writing results section, explaining the figures and tables, summarizing the result and conclusion, references. Choosing a journal.

Unit-IV **[No. of Hours: 2]**

Presenting Manuscript: Presentation of Research paper.

Semester: 4th			
Paper code: AIDS216/AIML216/IOT216 (NUES)	**L**	**T/P**	**Credits**
Subject: Emerging Trends in Technological Industries	**1**	**0**	**1**
Marking Scheme			

1. Teachers Continuous Evaluation: 100

Course Objectives:	
1.	To Understand the importance of seeking experts in the technological domain
2.	To remain technically abreast with latest developments world-wide.
Course Outcomes:	
CO1	Understand the importance of having awareness of latest technological Trends.
CO2	Apply the knowledge gained by interacting with experts in their day to day lives.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	-	1	-	1	3	1	1	-	-	1	-	2
CO2	2	1	1	1	3	1	1	1	1	1	1	2

Course Overview:

In this, the faculty coordinator will invite experts from the industry/ academia to give seminars/webinars/expert lectures to students on recent technological advances in the industry. In every semester, at least 8 seminars/webinars/expert lectures should be conducted. An evaluation would be conducted by the faculty coordinator based on quiz, report submissions, etc. on the seminars/webinars/expert lectures conducted. The aim is to give the latest technical and research exposure to the students.

Semester: 4th			
Paper code: AIDS260/AIML260/IOT260	**L**	**T/P**	**Credits**
Subject: Practicum (Integrated Project)	**0**	**2**	**1**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO EVALUATORS: Maximum Marks: As per university norms
1. This is an Integrated Project to be created by the students on the basis of the knowledge gained by them. 2. The instructor will continuously evaluate the student's performance in the semester. 3. Practicum shall be evaluated based on the novelty, originality of work, contribution towards society. 4. Project report of the practicum will be submitted at the end of the semester

Course Objectives:	
1.	To enhance experiential learning component by applying the knowledge and skills gained through various subjects in developing a solution for real-world problems.
2.	To give an exposure to multi-disciplinary domains to identify problems that exist around them to develop solutions thereby improving their technical skillset and their employability.
3.	To increase the collaboration skills.
4.	To understand the feasibility, quality, novelty, innovation and the application of the project.
Course Outcomes:	
CO1	Apply engineering concepts learned so far for project identification, formulation, and a feasible solution.
CO2	Develop and demonstrate a comprehensive technical knowledge on the selected project topic.
CO3	Design novel and innovative technological solutions to real problems utilizing an integrated approach.
CO4	Apply theoretical knowledge and concepts gained from their coursework to real-world situations or projects within their field of study.

CO/PO	**PO01**	**PO02**	**PO03**	**PO04**	**PO05**	**PO06**	**PO07**	**PO08**	**PO09**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	3	2	2	1	2	1	1	3	3
CO2	3	3	3	3	2	2	1	2	1	1	3	3
CO3	3	3	3	3	2	2	1	2	1	1	3	3
CO4	3	3	3	3	2	2	1	2	1	1	3	3

Course Overview:

Under practicum the students will be involved in experiential learning. The students are required to apply the knowledge and skills gained through various subjects in developing a solution for solving real world problems. Interdisciplinary projects give an opportunity to students to identify

problems that exist around them for which they could develop solutions. Working as a team for the project also increases their collaboration skills.

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