Syllabus for 2nd year of UG

Artificial Intelligence and Data Science

Batch 2025 onwards

SEMESTER-III

Title of the course : **Programming for Software Development**

Subject Code : **PCAI-501**

Weekly load : **3 Hrs** **LTP 3-0-0**

Credit : **3**

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

CO1	Understand Python basics (variables, operators, I/O).
CO2	Apply decision-making and looping constructs.
CO3	Use functions and modules for modular programming.
CO4	Work with data structures and file handling.
CO5	Implement OOP concepts and exception handling with basic software engineering principles.

	CO/PO Mapping:(Strong(3)/Medium(2)/Weak(1)indicatesstrengthofcorrelation):													
CO'S	ProgramOutcomes(PO's)/ProgramSpecificOutcomes(PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	3	1	3	0	0	0	3	1	3	2	3	3
CO2	3	1	3	3	3	0	0	0	3	2	3	2	3	3
CO3	3	2	3	1	3	3	0	0	2	2	3	2	3	3
CO4	3	2	3	3	3	3	0	0	3	3	3	3	3	3
CO5	3	3	3	3	3	3	0	0	3	3	3	3	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	Input/Output Operations and Operators	Python installation, program structure, variables and data types, Arithmetic, relational, logical operators, expressions, type conversion, reading input, formatted output.	06
	Decision Making and Looping	if, if-else, nested if, elif ladder, for loop, while loop, nested loops, break, continue and pass statements.	06
	Functions and Modules	Function definition, parameters, return values, recursion, built-in functions, importing modules and packages.	06
	Data Structures	Lists, tuples, sets, dictionaries, operations on data structures, basic searching and sorting techniques.	06
Unit-2	Strings and File Handling	String manipulation, string methods, file opening/closing, reading and writing text files.	06
	Object-Oriented Programming	Classes and objects, attributes, methods, constructors, inheritance, polymorphism, encapsulation.	06
	Exception Handling	Errors and exceptions, try-except-finally, user-defined exceptions, introduction to standard libraries (math, random) and basic problem-solving applications.	06
	Software Engineering Concepts	A Generic view of Software engineering process - A layered technology, a process framework,Process patterns, process assessment. Process models: The waterfall model, Incremental process models, Evolutionary process model etc.	06

Total=48

Recommended Books:

1. Thareja, R., Python Programming: Using Problem Solving Approach, Oxford University Press.
2. Deitel, P., & Deitel, H., Python for Programmers, Pearson Education.
3. Downey, A., Think Python: How to Think Like a Computer Scientist, O'Reilly Media.
4. Rossum, G. van, & Drake Jr., F. L., An Introduction to Python, Network Theory Ltd.

Title of the course : **Foundations of Data Science**

Subject code : **PCAI-502**

Weekly load : **3 Hrs** **LTP 2-1-0**

Credits : **3**

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

CO1	Understand linear algebra concepts for data science (vectors, matrices, eigenvalues).
CO2	Apply probability, statistics, and distributions for data analysis.
CO3	Use hypothesis testing methods for statistical decision-making.
CO4	Perform data preprocessing and feature engineering techniques.
CO5	Implement predictive models and optimization methods for data-driven solutions.

	CO/PO Mapping: (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
COs	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	0	0	0	0	0	0	2	3	1
CO2	2	2	2	2	3	0	0	0	1	1	0	2	3	1
CO3	2	3	2	3	3	0	0	0	1	1	0	2	3	2
CO4	3	3	3	3	2	0	0	0	1	1	0	2	3	1
CO5	3	3	3	2	2	0	0	0	0	1	1	2	3	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	Linear Algebra for Data Science	Vectors and matrices, Matrix-vector multiplication, Rank and null space, Eigen value decomposition, Echeleon form, System of linear equation	4
	Linear Systems & Geometric Concepts	Over-determined systems, Pseudo-inverse, distance and projections	4
	Probability & Descriptive Statistics	Random variables, mean, variance, covariance, covariance matrix, Measurement of Central Tendency, Dispersion	4
	Distributions	Continuous (Bernaulli, Bi-nominal, Poison), Discrete (Normal, Exponential), Distributions, their properties, moments, Graphical Representation	4
Unit-2	Hypothesis Testing Fundamentals	Introduction to hypothesis testing, One-tailed and two-tailed tests, Type I and Type II errors, Test statistics	2
	Data Preprocessing	Types of data (structured, unstructured, semi-structured), Missing values and outliers, Normalization and standardization, Encoding, scaling, transformation	6
	Feature Engineering	Feature Selection, Feature deduction, Optimization Techniques and Feature Engineering	4
	Predictive Modeling & Optimization	Linear and multiple regression, Logistic regression, k-NN and k-means clustering, Cross-validation, Optimization techniques (constrained & unconstrained), Gradient descent and cost functions	4

Total=32

Recommended Books:

1. Cielen, D., Meysman, A. D. B., & Ali, M., *Introducing Data Science*, 1st Edition, Ebury Press, 2023.
2. Maheswari, U., & Sujatha, *Introduction to Data Science: Practical Approach with R and Python*, 1st Edition, Wiley, 2021.
3. Hastie, T., Tibshirani, R., & Friedman, J., *The Elements of Statistical Learning*, 2nd Edition, Springer, 2009.
4. McKinney, W., *Python for Data Analysis*, 3rd Edition, Shroff/O'Reilly, 2022.

Title of the course : **Introduction to DataStructures and Algorithms**

Subject Code : **PCAI-503**

Weekly load : **3Hrs** **LTP 2-1-0**

Credit : **3**

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

CO1	Understand fundamental data structures and algorithm complexity concepts.
CO2	Apply array and linked list operations for data organization.
CO3	Implement stacks, queues, and tree structures for efficient problem-solving.
CO4	Analyze graphs, sorting, and searching techniques.
CO5	Perform file handling operations for data storage and retrieval.

	CO/PO Mapping:(Strong(3)/Medium(2)/Weak(1)indicatesstrengthofcorrelation):													
Cos	ProgramOutcomes(PO's)/ProgramSpecificOutcomes(PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	0	0	0	2	0	0	0	1	0
CO2	3	3	3	3	3	2	0	0	3	3	3	2	3	2
CO3	3	3	3	3	3	2	0	0	3	3	3	3	3	3
CO4	3	3	3	3	3	2	0	0	3	3	2	2	3	3
CO5	3	3	3	3	3	3	0	0	3	3	2	3	3	3

Theory

Unit	**Main Topics**	**Course Outlines**	**Lecture(s)**
Unit-1	Basics of data structures	Data structures and data structure operations, Algorithmic complexity, time-space trade off and recursion.	04
	Arrays	Representation of an array, One-dimensional array, Multidimensional arrays, Address calculation	04
	Linked List	Basic concepts of linked list – memory representation, building a linked list, traversing, insertion, deletion, searching; Doubly linked list; Merging two lists; Header linked list; Circular linked list.	04
	Stacks & Queues	Representation of stack, Implementation of stack; Polish notation; Queues; Implementation of queues; Circular queues; Double ended queues; Priority queues.	04
Unit-2	Trees	Binary trees; Complete binary trees; Extended binary tree; Representation of binary tree; Insertion and deletion from the binary tree; Tree traversals using in-order, pre-order and post-orders; binary search tree, Heap tree, Balanced binary tree, B-trees.	04
	Graphs	Basic concepts &definitions; Representation of graph – Adjacency list, Adjacency matrix; Path matrix, Graph traversal– BFS, DFS; Shortest path algorithms.	04

	Sorting &Searching	Linear search; Binary search; Bubble sort; Insertion sort; Quick sort; Selection sort; Merge sort; Heap sort; Selection sort, Hashing Techniques.	04
	File Handling	File streams, handling files, Reading/Writing of files, Accessing records randomly, Updating files	04

Total=32

Recommended Books:

1. Lipschutz, S., Data Structures, Schaum's Series, Tata McGraw-Hill (TMH).
2. Goodrich, M. T., Goldwasser, M. H., & Tamassia, R., Data Structures and Algorithms in Python, Wiley.
3. Tremblay, J. P., & Sorenson, P. G., An Introduction to Data Structures with Applications, Tata McGraw-Hill (TMH).

Title of the course : **Programming for Software Development Lab**

Subject Code : **PCAI-504**

Weekly load : **2Hrs** **LTP 0-0-2**

Credit : **1**

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

CO1	Perform Python installation and execute basic programming operations.
CO2	Apply arithmetic, looping, and function concepts to solve problems.
CO3	Manipulate arrays (1D and 2D) and perform data operations.
CO4	Implement string processing and file handling techniques.
CO5	Analyze project requirements and select appropriate software design models.

CO/POMapping:(Strong(3)/Medium(2)/Weak(1)indicatesstrengthofcorrelation):														
Cos	ProgramOutcomes(PO's)/ProgramSpecificOutcomes(PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	3	0	0	3	3	3	2	3	2
CO2	3	3	3	2	2	2	0	0	3	3	3	2	3	2
CO3	3	3	3	2	3	2	0	0	3	2	3	3	3	3
CO4	3	3	3	3	3	3	0	0	3	2	3	3	3	3
CO5	3	3	3	3	3	3	0	0	3	3	3	3	3	3

LISTOFPRACTICALS

WRITE EXPIREMENTS ON FOLLOWING: -

1. Installation of Python and Packages.
2. Arithmetic Operations.
3. Looping Statements.
4. Solving the series Fibonacci.
5. Functions data exchange using function working with 1D array.
6. Add/remove elements in 1D array.
7. Working with 2D array.
8. Strings and different operations on strings without using inbuilt functions.
9. File Handling.
10. Records.
11. The planning and identifying need/requirements of projects.
12. Identifying software design model based on requirement.

Note: The above-mentioned list of experiments is suggested list. The teacher may add more programs/ experiments as per requirement.

Title of the course **: Data Science Lab**

Subject Code **: PCAI-505**

Weekly load **: 4 Hrs** **LTP 0-0-4**

Credit **: 2**

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

CO1	Install and use Python data science libraries for data handling and visualization.
CO2	Apply linear algebra concepts (vectors, matrices, eigenvalues) in computations.
CO3	Perform statistical analysis including variance, covariance, and distributions.
CO4	Conduct hypothesis testing and data preprocessing techniques.
CO5	Implement feature selection and reduction methods for data analysis.

	CO/PO Mapping: (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
COs	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	3	0	0	0	1	1	0	2	3	1
CO2	3	2	2	2	2	0	0	0	0	0	0	2	3	1
CO3	2	3	2	3	2	0	0	0	1	1	0	2	3	2
CO4	2	3	2	2	3	0	0	0	1	1	0	2	3	2
CO5	3	3	3	2	2	0	0	0	1	1	1	2	3	2

LIST OF PRACTICALS

WRITE EXPIREMENTS ON FOLLOWING: -

1. Install and use of various libraries used for data handling in python: -
   a) Anaconda and JupyterNotebook.
   b) NumPy, Pandas, SciPy, Matplotlib packages and learn basis operations on datasets using these packages.
   c) Load data from file stored in local computer and visualize it.
2. Working with vectors and matrices.
3. Computing and working with eigen values.
4. Computing variance and co-variance.
5. Identifying distributions and their properties.
6. Hypothesis Testing.
7. Data Standardization, Normalization and Scaling.
8. Identifying missing values.
9. Feature Reduction (eg. PCA)
10. Feature Selection (eg. Forward Selection, Backward Selection) and their Hybrid Methods.
11. Classification (SVM, Decision Tree).
12. Optimization Techniques.

Note: The above-mentioned list of experiments is suggested list. The teacher may add more programs/ experiments as per requirement.

Title of the course : **Data Structures and Algorithms Lab**

Subject Code : **PCAI-506**

Weekly load : **4Hrs** **LTP 0-0-4**

Credit : **2**

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

CO1	Perform operations on arrays and multi-dimensional data structures.
CO2	Implement and manage linked lists (singly, doubly, and variants).
CO3	Apply stack and queue operations including deque management.
CO4	Construct and traverse trees and graphs using various algorithms.
CO5	Implement searching and sorting techniques across data structures.

	CO/POMapping:(Strong(3)/Medium(2)/Weak(1)indicatesstrengthofcorrelation):													
COs	ProgramOutcomes(PO's)/ProgramSpecificOutcomes(PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	0	0	0	1	0	0	2	2	2
CO2	3	3	3	2	3	2	0	0	3	3	3	2	3	3
CO3	3	3	3	2	3	2	0	0	2	2	3	2	3	3
CO4	3	3	3	3	3	3	0	0	3	2	2	3	3	2
CO5	3	3	3	3	3	3	0	0	3	3	3	3	3	3

LIST OFPRACTICALS

WRITE EXPIREMENTS ON FOLLOWING: -

1. Operations (Creation, Insertion, Deletion, Sorting) in 1D array.
2. Operations (Creation, Insertion, Deletion) in 2D array.
3. Creating and working with multi-dimensional array.
4. Operations (Creation, Insertion, Deletion) in linked list.
5. Operations (Creation, Insertion, Deletion) in Doubly linked list.
6. Management of Header, two-way, two-way header linked list.
7. Operations (Creation, Insertion, Deletion) in Stacks, Queues.
8. Management of Dequeues.
9. Creation of Binary Tree, Binary research tree using array and linked list.
10. Operations (Insertion, Deletion) in Binary Tree.
11. Operations (Searching, Insertion) in binary search tree.
12. Working with AVL Trees.
13. Various traversing algorithms for different trees.
14. Creating graphs using linked list.
15. Searching in graphs.
16. Various traversing algorithms for graph.
17. Implementation of different searching operations on different Data Structure.
18. Sorting Algorithms.

Note: The above-mentioned list of experiments is suggested list. The teacher may add more programs/ experiments as per requirement.

SEMESTER-IV

Title of the course **: Operating System**

Subject Code **: PCAI-507**

Weekly load **: 3 Hrs** **LTP 3-0-0**

Credit **: 3**

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

CO1	Understand operating system concepts, types, and system structures.
CO2	Analyze process management, threads, and inter-process communication.
CO3	Apply CPU scheduling algorithms for process optimization.
CO4	Implement synchronization techniques and handle deadlocks.
CO5	Manage memory, file systems, and compare OS architectures.

CO/PO Mapping : (Strong(S)/Medium(M)/Weak(W) indicates strength of correlation):

Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	3	2	0	0	2	2	2	2	2	2
CO2	3	2	2	2	2	2	0	0	2	3	3	2	3	3
CO3	3	3	2	2	0	3	0	0	3	2	2	2	3	2
CO4	3	2	2	2	2	2	0	0	3	3	2	2	2	2
CO5	3	2	1	2	0	2	0	0	3	2	2	2	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	**Introduction & System Calls**	Evolution of Operating System, Types of OS: (Batch, Time-sharing, Distributed, Real-time), Handheld OS: (Palm, Symbian, Linux, Windows, Android etc.), OS structures: (Monolithic, Layered, Microkernel), System calls: (process, file, device, information), Dual mode operations	06
	Processes and Threads Concepts	Process lifecycle and Process Control Block, Context switching, Threads and multithreading models, Inter Process Communication: shared memory and message passing	06
	CPU Scheduling	Scheduling criteria, FCFS, SJF, Priority, Round Robin, Multilevel queue scheduling, Real-time scheduling basics	06
	Process Synchronization & Classical Problems	Critical section problem, Semaphores, Mutex, Monitors, Producer-Consumer, Dining Philosophers, Readers-Writers	06
Unit-2	**Deadlocks**	Deadlock conditions, Resource allocation graph, Prevention, avoidance (Banker's Algorithm), Detection and recovery	06
	Memory Management	Contiguous allocation, Paging and segmentation, Demand paging, Page replacement: FIFO, LRU, Optimal, Thrashing, Virtual Memory, Page Replacement Algorithms	08
	Files, Directories & Security	File attributes and operations, Directory structures, File allocation methods, Access control and protection, System threats and malware	06
	Case Studies	UNIX architecture, Windows architecture, Comparison	04

Total=48

Recommended Books:

1. Silberschatz, A., & Galvin, P. B., *Operating System Concepts*, John Wiley & Sons.
2. Stallings, W., *Operating Systems: Internals and Design Principles*, Pearson.
3. Tanenbaum, A. S., *Operating Systems: Design and Implementation*, PHI.
4. Crawley, *Operating Systems: An Object-Oriented Approach*, McGraw-Hill.

Title of the course **: Database System and Applications**

Subject code **: PCAI-508**

Weekly load **: 3 Hrs** **L T P 2-1-0**

Credit **: 3**

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

CO1	Understand database concepts, DBMS architecture, and data modeling techniques.
CO2	Design databases using E-R models and relational schema principles.
CO3	Apply normalization techniques to ensure data integrity and efficiency.
CO4	Use SQL for data definition, manipulation, and query processing.
CO5	Analyze transaction management, concurrency control, and recovery mechanisms.

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
Cos	COs Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	3	1	0	0	0	1	1	1	3	2
CO2	2	3	3	3	3	2	0	0	1	1	1	1	3	2
CO3	3	3	2	2	3	1	0	0	0	1	0	1	3	2
CO4	3	3	2	3	3	1	0	1	0	1	1	1	3	2
CO5	2	3	3	3	3	2	0	1	1	1	1	1	3	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	Basics of data processing	Data, data processing requirement, desirable characteristics of an ideal data processing system, traditional file based system, its drawback, concept of data dependency, Def of database, database management system.	04
	Database concepts	3-schema architecture: external-conceptual-internal, database terminology, benefits of DBMS, Database development process - conceptual data modeling, logical database design, physical database design, database implementation, database maintenance.	04
	Database Analysis	Conceptual data modeling using E-R data model -entities, attributes, relationships, generalization, specialization, specifying constraints: total and partial participation. 5 – 6 practical problems based on E-R data model.	04
	Database Design	Logical database design and relational data model: Introduction to relational database theory: *def* of relation, relational model operators, relational model integrity rules, Normalization- 1NF, 2NF, 3NF, 4NF, BCNF & practical problems based on these forms. Denormalization	04
	Database Implementation	Introduction to SQL, DDL aspect of SQL, DML aspect of SQL – update, insert, delete & various form of SELECT-simple, using special operators, aggregate functions, group by clause, sub query, joins, co-related sub query, union clause.	04

Unit-2	Query optimization	Introduction, Query plan, ways of evaluating a given query, Overview of optimization process, expression transformation, database statistics, A divide and conquer strategy.	04
	Transaction processing	Transaction concept, transaction state, Implementation of atomicity and durability, concurrent execution, Serializability, recoverability, Implementation of isolation, transaction definition in SQL.	04
	Overview of backup and recovery process	Failure classification, Storage structure, recovery and atomicity, log-based recover, shadow paging, recovery with concurrent transaction, buffer management, failure with loss of non- volatile storage, advance recovery techniques.	04

Total=32

Recommended Books:

1. Silberschatz, A., Korth, H. F., & Sudarshan, S., *Database System Concepts*, Tata McGraw-Hill (TMH).
2. McFadden, F. R., Hoffer, J. A., & Prescott, M. B., *Modern Database Management*, Pearson.
3. Date, C. J., *An Introduction to Database Systems*, Addison-Wesley.
4. Ramakrishnan, R., & Gehrke, J., *Database Management Systems*, McGraw-Hill.
5. Dunham, M. H., *Data Mining: Introductory and Advanced Topics*, Pearson.

Title of the course **: Introduction to Artificial Intelligence**

Subject code **: PCAI-509**

Weekly load **: 3 Hrs** **LTP 2-1-0**

Credit **: 3**

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

CO1	Understand fundamental AI concepts, agents, and knowledge representation.
CO2	Apply search algorithms and heuristic techniques for problem-solving.
CO3	Analyze adversarial search and constraint satisfaction problems.
CO4	Explore machine learning, clustering, and reinforcement learning methods.
CO5	Understand NLP and generative AI concepts with real-world applications.

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
COs	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	0	0	0	1	0	2	3	2
CO2	3	3	2	2	2	1	0	0	0	1	1	2	3	2
CO3	2	3	2	3	2	2	0	0	0	2	2	2	3	2
CO4	2	2	2	3	3	2	0	0	2	2	2	3	3	2
CO5	2	2	2	2	3	2	0	0	2	2	2	2	2	3

Theory

Unit	Main Topics	Course Outline	Lecture(s)
Unit-1	Introduction	AI concepts, agents, types of agenda, structure of agents, knowledge base	04
	Searching	Problem solving by searching, heuristic search strategies, heuristic functions, local search algorithm	06
	Adversarial search	Searching & optimal decisions in games, alpha-beta pruning, constraints satisfaction problems, backtracking search in CSP	06
Unit-2	Learning	Focus of learning, different regression and classification models, machine learning, ensemble learning, clustering	06
	Reinforcement Learning	Active and passive reinforcement learning, generalization in reinforcement learning, Natural Language Processing, Processing text classification, speech recognition, syntactic analysis (passing), machine translation	06
	Generative AI	Concept, basic architecture, applications	04

Total = 32

Recommended Books:

1. Russell, S., & Norvig, P., *Artificial Intelligence: A Modern Approach*, 4th Edition, Pearson, 2020.
2. Nilsson, N. J., *Principles of Artificial Intelligence*, Springer, 1982.
3. Luger, G. F., *Artificial Intelligence: Structures and Strategies for Complex Problem Solving*, 6th Edition, Pearson.
4. Rich, E., & Knight, K., *Artificial Intelligence*, 3rd Edition, Tata McGraw-Hill.
5. Poole, D., & Mackworth, A., *Artificial Intelligence: Foundations for Computational Agents*, 2nd Edition, Cambridge University Press, 2017.

Title of the course : **Operating System Lab**

Subject Code : **PCAI-510**

Weekly load : **2 Hrs** **LTP 0-0-2**

Credit : **1**

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

CO1	Implement CPU scheduling algorithms for process management optimization.
CO2	Apply process synchronization techniques using semaphores and classic problems.
CO3	Analyze and solve deadlock avoidance and detection scenarios.
CO4	Implement memory management techniques including paging, segmentation, and allocation strategies.
CO5	Apply file system and disk scheduling algorithms for efficient resource management.

CO/PO Mapping : (Strong(S)/Medium(M)/Weak(W) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO 2
CO1	3	2	2	3	2	2	0	0	2	2	2	2	3	3
CO2	3	2	2	2	2	2	0	0	2	2	3	2	3	2
CO3	3	2	2	2	1	2	0	0	3	3	2	2	3	2
CO4	3	3	2	2	2	2	0	0	3	2	2	3	3	2
CO5	3	3	2	2	2	2	0	0	2	3	2	2	3	2

LIST OFPRACTICALS

WRITE EXPIREMENTS ON FOLLOWING: -

1. CPU Scheduling Algorithms (FCFS, SJF, RR, Priority).
2. Process Synchronization (Producer-Consumer using Semaphores).
3. Dining Philosophers Problem.
4. Algorithms for Deadlock Avoidance.
5. Deadlock Detection Methods.
6. Page Replacement Algorithms (FIFO, LRU, Optimal).
7. Memory Allocation Techniques (First Fit, Best Fit, Worst Fit).
8. Paging and Segmentation Techniques.
9. File Allocation Methods (Sequential, Indexed, Linked).
10. Disk Scheduling Algorithms.

Note: The above-mentioned list of experiments is suggested list. Teacher may add more programs/ experiments as perrequirement.

Title of the course **: Database System and Applications Lab**
Subject code **: PCAI-511**
Weekly load **: 4 Hrs** **LTP 0-0-4**
Credit **: 2**

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

CO1	Install and configure DBMS/RDBMS software for database operations.
CO2	Apply DDL, DML, and DCL commands for database management.
CO3	Design tables and implement ER diagrams for data modeling.
CO4	Execute SQL queries including keys, indexing, and optimization techniques.
CO5	Implement normalization, denormalization, locking, and distributed database concepts.

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO 4	PO 5	PO6	PO7	PO 8	PO9	PO1 0	PO1 1	PO1 2	PSO1	PSO 2
CO1	3	3	2	2	3	1	0	0	0	1	0	1	3	2
CO2	3	3	2	3	3	1	0	0	0	1	1	1	3	2
CO3	2	3	3	3	3	2	0	0	1	1	1	1	3	2
CO4	2	2	3	3	3	2	0	1	2	2	1	1	3	3
CO5	2	3	3	3	3	2	0	1	2	2	2	2	3	3

LIST OFPRACTICALS

WRITE EXPIREMENTS ON FOLLOWING: -

1. Installation of DBMS and RDBMS related software packages.
2. Implementation of DDL, DML and DCL commands.
3. Creation of tables and files.
4. Implement various SQL queries.
5. Creation of ER diagrams.
6. Creation of indexes and implementation of primary keys, secondary keys concepts.
7. Implementation of normalization.
8. Implementation of De-normalization.
9. Implementation of various types of locks.
10. Learning to work with files in the cases of distributed and parallel databases.

Note: The above mentioned list of experiments is suggested list. Teacher may add more programs/ experiments as per requirement.

Title of the course **: Artificial Intelligence Lab**

Subject code **: PCAI-512**

Weekly load **: 2 Hrs** **LTP 0-0-2**

Credit **: 1**

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

CO1	Apply search strategies including heuristic and local search techniques.
CO2	Implement adversarial search with pruning methods.
CO3	Develop classification and regression models using AI/ML techniques.
CO4	Apply ensemble learning and clustering algorithms for data analysis.
CO5	Implement reinforcement learning and basic NLP tokenization methods.

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO 4	PO 5	PO6	PO7	PO 8	PO9	PO1 0	PO1 1	PO1 2	PSO1	PSO 2
CO1	3	3	2	2	3	1	0	0	0	1	0	1	3	2
CO2	3	3	2	3	3	1	0	0	0	1	1	1	3	2
CO3	2	3	3	3	3	2	0	0	1	1	1	1	3	2
CO4	2	2	3	3	3	2	0	1	2	2	1	1	3	3
CO5	2	3	3	3	3	2	0	1	2	2	2	2	3	3

LIST OFPRACTICALS

WRITE EXPIREMENTS ON FOLLOWING:

1. Applying different searching strategies (Heuristic search, Local Search).
2. Implementing pruning methods.
3. Applying classification methods (Eg. Sum, Decision Tree, Neuro-networks).
4. Applying various regression models.
5. Various options to implement ensemble approaches.
6. Implement different clustering models (Eg. K-Means, DB SCAN).
7. Apply the concepts reinforcement learning.
8. Implement DQN based procedure.
9. Implement basic NCP strategies for tokenization.

Note: The above mentioned list of experiments is suggested list. Teacher may add more programs/ experiments as per requirement.