Annasaheb Dange College of Engineering and Technology Ashta

An Autonomous Institute affiliated to Shivaji University Kolhapur

Curriculum Structure

S.Y. B. Tech. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SEM III & SEM IV

(Academic Year 2023- 2024)

Annasaheb Dange College of Engineering and Technology
Artificial Intelligence and Data Science Department
Teaching and Evaluation Scheme

S. Y. B. Tech Semester III

Course Code	Course Name	Teaching Scheme				THEORY							PRACTICAL						GRAND TOTAL
						ISE		MSE + ESE			Total	Min	ISE		ESE		Total	Min	
		L	T	P	Credits	Max	Min	MSE	ESE	Min			Max	Min	Max	Min			
1ADPC201	Discrete Mathematics and Theory of Computation	3	1	-	4	40	16	30	30	24	100	40	-	-	-	-	-	-	100
1ADPC202	Data Structures	3	-	2	4	40	16	30	30	24	100	40	50	20	50	20	100	40	200
1ADPC203	Operating Systems	3	-	2	4	40	16	30	30	24	100	40	50	20	-	-	50	20	150
1ADPC204	Foundations of Artificial Intelligence	3	-	2	4	40	16	30	30	24	100	40	50	20	-	-	50	20	150
1ADHS205	Psychology	2	-	-	2	50	20	-	-	-	50	20	-	-	-	-	-	-	50
1ADHS207	Constitution of India	1	-	-	1	25	10	-	-	-	25	10	-	-	-	-	-	-	25
1ADVS206	Python for Data Science	2	-	2	3	-	-	-	-	-	-	-	50	20	50	20	100	40	100
1ADCC208	Aptitude and Reasoning Part - I	-	-	2	1	-	-	-	-	-	-	-	50	20	-	-	50	20	50
		17	**1**	**10**	**23**														**825**
	Total Contact Hours	**28**																	

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Class	S Y B. Tech Sem III
Course Code & Course Title	1ADPC201- Discrete Mathematics and Theory of Computation
Prerequisite/s	-
Teaching Scheme (Lecture/ Tutorial /Practical)	3/1/0
Credits	4
Evaluation Scheme Theory: ISE/ MSE/ ESE	40/30/30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADPC201_1	Proficiently calculate permutations and combinations to solve given problems using appropriate formulas.
1ADPC201_2	Proficiently solve problems of mathematical logic and set theory using appropriate formulas/laws.
1ADPC201_3	Accurately Build finite state machines for regular language or regular expression over a given alphabet and convert one form of finite state machine to another form by using appropriate conversion method.
1ADPC201_4	Proficiently Construct grammars (context free/ regular) for given language (context free/ regular) over a given alphabet and convert given context free grammar in CNF Form by using conversion method.
1ADPC201_5	Accurately Build deterministic and non-deterministic pushdown automata for given language or grammar over a given alphabet and stack symbols.
1ADPC201_6	Proficiently Construct Turing Machines for given language, function over a given alphabet and tape symbols.

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Permutations, Combinations and Discrete Probability:** Permutations and Combinations: rule of sum and product, Permutations, Combinations, Conditional Probability, Bayes' Theorem	06 Hrs.
Unit 2	**Mathematical logic:** Introduction, statements and notations, connectives – negation, Conjunction, disjunction, conditional, bi-conditional, Statement formulas and truth tables, well-formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological implications, functionally complete sets of connectives, other connectives, normalforms	06Hrs.

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Unit 3	**Set theory and Algebraic systems:** Basic concepts of set theory, operations on sets, orderedpairs, Cartesian Product, relation, properties of binary relations, matrix and graph representation, partition and covering of set, equivalence relation, composition of relations, POSET and Hassediagram, Function – definition, types Algebraic Systems, homomorphism, Semigroups and Monoids, properties and examples, Groups: Definition and examples	08 Hrs.
Unit 4	**Mathematical Induction, Regular Languages & Finite Automata** Regular expressions and corresponding regular languages, examples and applications, Finite automata-definition and representation, Non-deterministic F.A.,NFA with null transitions, Equivalence of FA's , NFA's and NFA's with null transitions.	08 Hrs.
Unit 5	**Grammars and Languages** Types of Languages, Derivation and ambiguity, Union, Concatenation and *'s of CFLs, eliminating production & unit productions from CFG, Eliminating useless variables from a context Free Grammar. CNF Notation.	05 Hrs.
Unit 6	**Push Down Automata and Turing Machines** PDA Definition, Deterministic PDA & types of acceptance, Equivalence of CFG's & PDA's. TM- Models of computation, definition of Turing Machine as Language acceptors, combining Turing Machines	06 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Yearof Edition
1	Discrete Mathematical Structures with application to Computer Science (Unit 2,3)	J. P. Tremblay & R. Manohar	Tata MGH International	-	2007
2	Elements of Discrete Mathematics(Unit1)	C. L. Liu and D. P. Mohapatra	SiE Edition, TataMcGraw- Hill	4th	2013
3	Introduction to languages & theory of computations (Unit 4,5,6)	John C. Martin	Tata McGraw Hill Edition	3rd	2007
4	Introduction to Automata Theory, Languages and computation	John E. Hopcraft, Rajeev Motwani,Jeffrey D. Ullman	Pearson Edition	3rd	2006

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Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Yearof Edition**
1	Discrete Mathematics and its Applications	Kenneth H. Rosen (AT&T Bell Labs) (mhhe.com/rosen)	Tata Mc Graw Hill	7th	2012
2	Discrete Mathematics, Schaum'soutlines.	SemyourLipschutz, MarcLipson	Tata Mc Graw Hill	3th	2012
3	Introduction to theory of computations	Michael Sipser	Cengage Learning	3rd	2012
4	Theory of Computation-A problem solving Approach	Kavi Mahesh	Wiley india	1st	2005

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Class	S Y B. Tech Sem III
Course Code & Course Title	1ADPC202 - **Data Structures**
Prerequisite/s	Problem-Solving Using C
Teaching Scheme (Lecture/ Tutorial /Practical)	3/0/2
Credits	4
Evaluation Scheme Theory: ISE/ MSE/ ESE	40/30/30
Evaluation Scheme Practical: ISE/ ESE	50/50

Course Outcomes (COs) : The students will be able to:	
1ADPC202_1	Describe fundamentals in data structures
1ADPC202_2	Explain the fundamental concepts of structuring, managing and organizing the data using linear data structures with ADTs
1ADPC202_3	Apply appropriate solution to solve the problem using linear data structure
1ADPC202_4	Demonstrate the fundamental concepts of structuring, managing and organizing the data using nonlinear data structures with ADTs
1ADPC202_5	Apply appropriate solution to solve the problem using nonlinear data structure
1ADPC202_6	Design Compare and analyze different data structure algorithms and searching, sorting methods using concepts like complexity

Course Contents:

Unit No	Unit Name	Contact Hours
Unit 1	**Basics of Data Structures**: Algorithm, ADT, Space and Time Complexity, Direct and Indirect recursion, analysis of recursive functions e.g. Towers of Hanoi	4 Hrs
Unit 2	**Lists** Definition, representation, operations, implementation and applications of singly, doubly and circular linked lists.	6Hrs
Unit 3	**Stack and Queue** Stacks as ADT, operations, representation using static and dynamic structures, applications of stack Queue as ADT, operations, representation using static and dynamic structures, circular queue, priority queue, double ended queue.	8 Hrs
Unit 4	**Searching and Sorting Techniques** Linear search, binary search, Internal and External Sorts, bubble sort, selection sort, insertion sort, merge sort, quick sort, radix sort, heap sort. Hashing – Definition, hash functions, overflow, collision, Collision resolution techniques, Open addressing, Chaining.	9 Hrs
Unit 5	**Trees** Basic terminology, representation, binary tree, traversal methods, binary search tree, AVL search tree, Heaps- Operations and their applications, Introduction to M-way trees.	7 Hrs
Unit 6	**Graphs** Basic concept of graph theory, storage representation: adjacency matrix, adjacency list, adjacency multi-lists, graph traversal techniques- BFS and DFS	5 Hrs

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List of Experiments	
1.	Programs based on array, function, pointer, structures
2.	Singly Linked List
3.	Doubly Linked List
4.	Circular Linked List
5.	Stack ADT – Static and Dynamic
6.	Queue ADT – Static and Dynamic
7.	Stack application, circular and double ended queue
8.	Searching – Linear, Binary and Hashing
9.	Sorting – Bubble, Selection, Insertion,
10.	Sorting – Merge and Quick
11.	Binary Search Tree, Traversal of Trees
12.	Micro project / Graph using adjacency list and traversal

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Data Structures- A Pseudocode Approach with C	Richard F. Gilberg and Behrouz A. Forouzon	Cengage Learning	2nd	2004
2	Data Structures with C Schaum's Outlines Series	S. Lipschutz	Tata McGraw-Hill	-	2017
3	Data Structure using C	Reema Thareja	Oxford	2nd	2014

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Data Structure using C	A. M. Tanenbaum, Y. Langsam, M. J. Augenstein	Prentice-Hall Of India Pvt. Limited	-	2003
2	Understanding Pointers in C	YashavantKanetkar	BPB Publication	1st	2009
3	C and Data Structures	N. B. Venkateshwarlu, E. V. Prasad	S. Chand and Company	-	2010
4	Let Us C	Yashavant Kanetkar	BPB Publication	15th	2016

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Class	S Y B. Tech Sem III
Course Code & Course Title	1ADPC203- **Operating Systems**
Prerequisite/s	Problem Solving Using C, Computer Networks
Teaching Scheme(Lecture/ Tutorial /Practical)	3/0/2
Credits	4
Evaluation Scheme Theory: ISE/ MSE/ ESE	40/30/30
Evaluation Scheme Practical: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADPC203_1	Analyze basic concepts of operating system and their structures to compare various operating systems using various OS parameters.
1ADPC203_2	Analyze issues related to inter process communication, process scheduling and resource management with the help of different scheduling algorithm.
1ADPC203_3	Develop appropriate solution to solve critical section problem by using accurate operating system algorithm.
1ADPC203_4	Use deadlock avoidance techniques and Memory management techniques with suitable algorithm to handle a deadlock situation and memory management in OS.
1ADPC203_5	Synthesize the concepts of I/O management, file system implementation and problems related to security and protection using appropriate security parameters.

Course Contents:

Sr. No.	Unit Name	Contact Hours
Unit 1	**Overview** Introduction to Operating Systems, Operating System functions, Computer System organization, Operating System Architecture, Operating System Structure, Operating System operations, Types of Operating Systems, Operating System Services, User - Operating System interface, System calls, Types of system Calls, System programs, Kernel, Types of kernel.	06 Hrs.
Unit 2	**Process Management** Process concept: Process scheduling, Operations on processes, Inter-process communication, Multi-Threaded Programming: Overview, Multi-Threaded Models, Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple-Processor scheduling	08 Hrs.
Unit 3	**Process Synchronization** Background, Mutual Exclusion, the critical section problem, Peterson's solution, synchronization hardware, semaphores, classic problems of Synchronization	06 Hrs.
Unit 4	**Deadlock** System model, deadlock characterization, methods for handling deadlocks, deadlock preventions, deadlock avoidance, deadlock detection, deadlock recovery.	07 Hrs.
Unit 5	**Memory Management**	06 Hrs.

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	Memory Management Strategies: Background, swapping, contiguous memory allocation, paging, structure of the page table, Segmentation. Virtual Memory Management: Background, demand paging, copy-on-write, page replacement	
Unit 6	**Storage Management& I/O Subsystem** File System: File concept, access methods, directory and disk structure, file-system mounting, file sharing, protection, Overview of I/O system, I/O hardware, Application I/O interface, Kernel I/O subsystem.	06Hrs.

List of Experiments	
1.	Installation of Multiple Operating System.
2.	Study and demonstration of basics of Linux/UNIX commands.
3.	Program based on CPU Scheduling Algorithms.
4.	Program to demonstrate critical section and mutual exclusion.
5.	Program based on Bankers algorithm for Deadlock Avoidance.
6.	Program based on Bankers Algorithm for Deadlock Prevention.
7.	Program based on Page Replacement Policies.
8.	Program to simulate Paging technique of memory management.
9.	Program based on various I/O System calls of UNIX operating System.
10.	Program to simulate producer-consumer problem using semaphores.
11.	Case study on
12	Micro project

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Operating System Concepts [Unit 1-6]	Silberschatz, Galvin,	John Wiley	8	2009
02	Operating systems concepts and design [Unit 1]	Dhananjay M Dhamdhere	Tata McGraw Hill	2	2006
03	Operating Systems - A Concept Based approach	Dhananjay M Dhamdhere	Tata McGraw Hill	3	2007
04	Understanding Operating System	Understanding Operating System	Ann McHoes & Ida M. Flynn,(Thomson)	6	2014
05	The design of Unix Operating System	Maurice J. Bach	(PHI)	1st	2006
06	A practical Guide to Linux commands, Editors and shell programming	Mark G. Sobell	Pearson Education India	3rd	2013
07	Operating Systems concepts and design	Milan Milenkovic	TMGH	2nd	2001

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Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
01	Operating System A Design Oriented Approach	Charles Crowley	Tata McGraw Hill	1st	2001
02	Operating System with Case Studies in Unix, Netware and Windows NT	Achyut S. Godbole	Tata McGraw Hill	5th	2007
03	Operating Systems: Internals and Design Principles	William Stallings	Pearson Education International	8th	2014
04	Linux System Programming	Robert Love	SPD, O' REILLY	2nd	2007
05	Unix concepts and administration	Sumitabha Das	TMGH	4th	2006
06	A practical Guide to Unix system V	Mark G. Sobell	Benjamin cummings Pub.	2nd	2005

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Class	S Y B. Tech Sem III
Course Code & Course Title	1ADPC204 **Foundations of Artificial Intelligence**
Prerequisite/s	Problem Solving Using C
Teaching Scheme (Lecture/ Tutorial /Practical)	3/0/2
Credits	4
Evaluation Scheme Theory: ISE/ MSE/ ESE	40/30/30
Evaluation Scheme Practical: ISE	50

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
1ADPC204_1	Understand the basics of Artificial Intelligence
1ADPC204_2	Develop fundamental understanding of different problem-solving methods and search strategies
1ADPC204_3	Apply Knowledge Representation and Planning in Knowledge based systems
1ADPC204_4	Demonstrate ideas behind software agents to solve a problem
1ADPC204_5	Design applications for NLP that use Artificial Intelligence

Course Contents:		
Unit No.	**Unit Name**	**Contact Hours**
Unit 1	**AI Introduction** Introduction – Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to AI problems.	06 Hrs.
Unit 2	**PROBLEM SOLVING METHODS** Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Constraint Satisfaction Problems (CSP) - Backtracking Search - Optimal Decisions in Games – Alpha - Beta Pruning -Games that include an element of chance.	07 Hrs.
Unit 3	**SOFTWARE AGENT SYSTEMS** Introduction to Logical Agents, Uncertainty-Probability -Inference-Independence and Bayes' Rule- Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems	06 Hrs.
Unit 4	**KNOWLEDGE REPRESENTATION** First order logic, Syntax and semantics for first order logic, Knowledge engineering in first order logic, Inference in First order logic, prepositional versus first order logic– Unification and Lifting – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation	08 Hrs.

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Unit 5	**Planning** Classical Planning- algorithms for Classical Planning- Heuristics for planning- hierarchical planning- non-deterministic domains- time, schedule and resources- analysis	05 Hrs
Unit 6	**APPLICATIONS** AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot	07 Hrs.

List Of Experiments	
1	Implement basic search strategies – 8-Puzzle, 8 - Queens problem,
2	Implement Crypt arithmetic.
3	Implement A* algorithms
4.	Implement memory bounded A* algorithms
5.	Implement Minimax algorithm for game playing (Alpha-Beta pruning)
6.	Solve constraint satisfaction problems
7.	Implement propositional model checking algorithms
8.	Implement forward chaining, backward chaining
9.	Implement resolution strategies
10.	Build naïve Bayes models
11.	Implement Bayesian networks and perform inferences
12.	Micro-Project

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Artificial Intelligence –A Modern approach	Stuart J. Russell, Peter Norwig,	Pearson Education	3rd	2016
2	Artificial Intelligence	Elaine Rich and Kevin Knight	Tata McGraw Hill Publishing Company, New Delhi,	-	2014

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Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1	Prolog: Programming for Artificial Intelligence,	I. Bratko	Addison-Wesley Educational Publishers Inc.,.	Fourth edition	2015
2	The Quest for Artificial Intelligence	Nils J. Nilsson	Cambridge University Press	6th	2013
3	Artificial Intelligence: Foundations of Computational Agents	David L. Poole and Alan K. Mackworth	Cambridge University Press	-	2012
4	Multi Agent Systems	Gerhard Weiss	, MIT Press	Second Edition	2013

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Class	S Y B. Tech Sem III
Course Code & Course Title	1ADHS205- **Psychology**
Prerequisite/s	--
Teaching Scheme (Lecture/Practical/Tutorial)	2/0/0
Credits	2
Evaluation Scheme Theory: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADHS205_1	Identify types of emotions, domains of emotional intelligence and their effects on individual and group behavior for fostering empathy and positive relationships.
1ADHS205_2	Explain human behavior, cognition, and emotions by psychological theories in real-life scenarios and contexts.
1ADHS205_3	Discuss effective time management strategies to overcome time-related challenges.
1ADHS205_4	Interpret psychological factors that contribute procrastination to recognize the situational triggers.
1ADHS205_5	Apply the A-B-C model to manage stress for well-being.

Course Contents:

Unit No.	Unit Name	Contact Hrs
Unit 1	**Psychology** –Definition of Psychology, Different fields of Psychology, Introduction and Need of psychology	2Hrs
Unit 2	**Emotional Intelligence (EI) (Part one)**– Role of Emotions, Types of Emotions, Emotions/ stress and performance	3Hrs
Unit 3	**Emotional Intelligence (EI) (Part Two)**– Definition of Emotional Intelligence, Key signs of emotional Intelligence, How EI helps students, Marshmallow Experiment, Five domains of Emotional Intelligence	6Hrs
Unit 4	**Time Management**– Definition of Time Management, Need and importance of Time management for an individual, Effective steps/ strategies of Time Management, Obstacles of Time Management	4Hrs
Unit 5	**Procrastination** – Definition of Procrastination, Types of Procrastination excuses , How to work on excuses, Why Do People Procrastinate?, Procrastination Cycle, Challenging Your assumptions, techniques to beat Procrastination	6Hrs
Unit 6	**Stress Management** – Definition of Stress, A-B-C model for Stress, Identifying Stressful Thoughts and identifying cognitive distortions, Restructuring, Behavioral Coping Strategies	5Hrs

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Text Books:					
Sr. No.	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1	Organizational Behaviour- An Evidence-Based Approach	Fred Luthan	McGraw-Hill/Irwin	12th	2011
2	Essentials of Organizational Behaviour	Stephen P. Robbins Timothy A. Judge Katherine E. Breward	Pearson	-	2018
3	Essentials of organizational Behaviour	Stephen P. Robbins	Prentice Hall	7th	2002
4	Understanding and Managing Organizational Behaviour	Jennifer M. George Gareth R. Jones	Pearson	6th	2012
5	Emotional Intelligence at Work A Professional Guide	Dalip Singh	Response Books A division of Sage Publications	3rd	2006

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Class	S Y B. Tech Sem III
Course Code & Course Title	1ADVS206 **Python for Data Science**
Prerequisite/s	Problem Solving Using C
Teaching Scheme (Lecture/ Tutorial /Practical)	2/0/2
Credits	3
Evaluation Scheme Practical: ISE/ESE	50/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADVS206_1	Apply various fundamentals concept of python programming to solve real world problems by using IDLE.
1ADVS206_2	Apply modular approach like OOP, functions, Exception handling, file handling to solve various real world scenarios using Python IDE.
1ADVS206_3	Apply various inbuilt functions of NumPy Library for efficient storage and data operations by using IDE.
1ADVS206_4	Analyze the data using different inbuilt functions of Pandas by using IDE.
1ADVS206_5	Design and develop micro project to solve real world problems by using python programming.

Course Contents:		
Unit 1	**Basics of Python** **Basics of Python** Introduction to Data Science - Why Python? - Essential Python libraries - Python Introduction- Features, Identifiers, Reserved words, Indentation, Comments, Built-in Data types and their Methods: Strings, List, Tuples, Dictionary, Set - Type Conversion- Operators. Decision Control Statement: If statement, If..el-if.. else statement Repetitive Control Statement: While loop, for loop, The range statement Selection Control Statement: Break & continue, Else clause	**05 Hrs.**
Unit 2	**Modular Programming:** Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance, overlapping and overloading operators, Adding and retrieving dynamic attributes of classes **Function:** What is function, Define a function, Pass arguments, Arguments with default values, Arbitrary arguments, Local and global variables, Return a value from function, Mathematical functions, Random number functions, Mathematical constants, Recursive functions	**05Hrs.**
Unit 3	**Exception Handling, File Handling** Errors, Exception handling with try, handling multiple exceptions, writing your own exception **File Handling**: File handling modes, reading files, writing and spending to files, Handling file exceptions, The with statement.	**03Hrs**

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Unit 4	**Introduction To Numpy and Scikit learn:** NumPy Basics: Arrays and Vectorized Computation- The NumPyndarray-Creating ndarrays- Data Types for ndarrays- Arithmetic with NumPy Arrays- Basic Indexing and Slicing - Boolean Indexing-Transposing Arrays and Swapping Axes. Universal Functions: Fast Element-Wise Array Functions. Introduction scikit learn library for data science.	**05 Hrs.**
Unit 5	**Data Manipulation with Pandas:** Introduction to pandas Data Structures: Series, Data Frame, Essential Functionality: Dropping Entries- Indexing, Selection, and Filtering-Function Application and Mapping- Sorting and Ranking. Summarizing and Computing Descriptive Statistics- Unique Values, Value Counts, and Membership. Reading and Writing Data in Text Format.	**04Hrs.**
Unit 6	**Data Cleaning, Preparation and Visualization** Data Cleaning and Preparation: Handling Missing Data - Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Detecting and Filtering Outliers-String Manipulation: Vectorized String Functions in pandas. **Plotting with pandas:** Line Plots, Bar Plots, Histograms	**04 Hrs.**

Experiments List:	
1	Implement basic Python programs to demonstrate fundamental concepts by reading input from console.
2	Implement Python programs to demonstrate decision control and looping statements.
3	Apply Python built-in data types: Strings, List, Tuples, Dictionary, Set and their methods to solve any given problem
4.	Implement OOP concepts like Data hiding and Data Abstraction.
5.	Create user-defined functions with different types of function arguments
6.	Perform File manipulations operations- open, close, read, write, append and copy from one file to another.
7.	Handle Exceptions using Python Built-in Exceptions
8.	Implement various in built functions of NumPy library.
9.	Create Pandas Series and Data Frame from various inputs.
10.	Import any CSV file to Pandas Data Frame and perform the following: (a) Visualize the first and last 10 records (b) Get the shape, index and column details (c) Select/Delete the records (rows)/columns based on conditions. (d) Perform ranking and sorting operations. (e) Do required statistical operations on the given columns. (f) Find the count and uniqueness of the given categorical values. (g) Rename single/multiple columns.
11.	Import any CSV file to Pandas Data Frame and perform the following: (a) Handle missing data by detecting and dropping/ filling missing values. (b) Transform data using apply() and map() method. (c) Detect and filter outliers. (d) Perform Vectorized String operations on Pandas Series. (e) Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.

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12	Micro Project / Case Study

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Introduction to computing and Problem Solving with Python	Jeeva Jose and SojanLal	Khanna Book Publishing Co. (P) Ltd	1	2016
02	Programming Python	Mark Lutz	O'reilly	2	2001
03	Introduction to Programming using Python"	Y. Daniel Liang	Pearson	--	2012
04	Python Data Science Handbook: Essential Tools for Working with Data	JakeVanderPlas	O'Reilly	--	2017

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Core Python Programming	Wesley J. Chun	Prentice Hall	--	2006
02	Learning Python	Mark Lutz,	O'reilly	4th	2009

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Class	S Y B. Tech Sem III
Course Code & Course Title	1ADHS207- **Constitution of India**
Prerequisite/s	-
Teaching Scheme (Lecture/ Tutorial /Practical)	1/0/0
Credits	1
Evaluation Scheme Theory: ISE	25

Course Outcomes (COs) Upon successful completion of the course students will be able to:	
1ADHS207_1	**Explain** the meaning, importantacts and history related toIndian
1ADHS207_2	**Illustrate** the features of Indian constitution and interpretation of Preamble.
1ADHS207_3	**Interpret** fundamental rights and duties of the Indian Citizen to inculcate
1ADHS207_4	**Identify** different laws and regulations based upon Information Acts.
1ADHS207_5	**Distinguish** the functioning of Indian parliamentary system and legislative system at the centre and state level.

Course Contents:		**Hrs**
Unit 1	**Constitution: Basic Structure** Meaning of the constitution law and constitutionalism, Historical perspective of the constitution of India, Government of India Act of 1935 and Indian Independence Act of 1947.	02Hrs
Unit 2	**Making of Indian Constitution:** Enforcement of the Constitution, Meaning and importance of Constitution, Making of Indian Constitution – Sources, Salient features of Indian Constitution, Preamble.	02Hrs
Unit 3	**Fundamental Rights:** Fundamental Rights – Features and characteristics, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies.	03Hrs
Unit 4	**Fundamental Duties:** Directive Principles-Definition and Meaning, 42ndConstitutional Amendment Act, List and Importance of Fundamental Duties.	02Hrs
Unit 5	**Regulation to Information:** Introduction, Right to Information Act:2005, Information Technology Act 2000, Electronic Governance in India, Secure Electronic Records and Digital Signatures, Digital Signature Certificates, Cyber Regulations Appellate Tribunal.	02Hrs
Unit 6	**Government of The Union and States:** President of India – Election and Powers, Prime Minister of India - Election and Powers, Loksabha - Structure, Rajyasabha – Structure, Governor of State, Chief Minister and Council of Ministers in a state.	02Hrs

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Text Books:					
Sr. No.	**Title**	**Author**	**Publisher**	**Edition**	**Yearof Edition**
1	Introduction to the Constitution of India	Durga Das Basu	LexisNexis	23	2018
2	India's Constitution	M.V.Pylee	S. Chand Pub	16	2017
3	The Constitutional Law of India	J.N. Pandey	Central Law Agency	55	2018

Reference Books:					
Sr. No.	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1	Shorter Constitution of India	D.D. Basu	Prentice Hall of India		1996
2	Indian Constitutional Law	M.P. Jain	Wadhwa & Co		2005

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Class	S Y B. Tech Sem III
Course Code & Course Title	1ADCC208 **Aptitude and Reasoning Part-I**
Prerequisite/s	Basic mathematics
Teaching Scheme (Lecture/Tutorial/Practical)	0/0/2
Credits	1
Evaluation Scheme Practical: ISE	50

Course Outcomes (COs) : The students will be able to:	
1ADCC208_1	**Solve** problems based on Vedic Mathematics, Calendar, Average, and Age.
1ADCC208_2	**Solve** problems based on Speed Time distance and equations
1ADCC208_3	**Solve** problems based on Blood Relations, Directions, Time Rate Work, Pipes and Tanks, Percentage, Profit and Loss
1ADCC208_4	**Solve** Problems based on Spot the Error and Jumbled Para

Course Contents:

Unit No	Unit Name	Contact Hours
Unit 1	Vedic Mathematics, Calendar	4 Hrs
Unit 2	Average, Ages	4 Hrs
Unit 3	Speed Time Distance, Equations	4 Hrs
Unit 4	Blood Relations, Directions, Time Rate Work, Pipes and Tanks	4 Hrs
Unit 5	Percentage, Profit and Loss	4 Hrs
Unit 6	Spot the Error, Jumbled Para	4 Hrs
	Self-Study Module	6 Hrs

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	R.S. Agarwal (Quantitative aptitude)	R.S.Agarwal	S Chand	-	2019
2	R.S. Agarwal (Verbal & Non-verbal Reasoning)	R.S.Agarwal	S Chand	-	2010
3	Wren & Martin (Verbal, Grammar)	P.C.Wren	S Chand	-	2017

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	APTIPEDIA (Quantitative, Logical, Verbal Aptitude)	Face	Wiley	-	2017
2	Wiley (Quantitative Aptitude)	P.A.Anand	Maestro	-	2015
3	Arun Sharma (Verbal Ability)	Meenakshi Upadhyay	McGraw Hill	-	2020

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Annasaheb Dange College of Engineering and Technology Ashta

An Autonomous Institute affiliated to Shivaji University Kolhapur

Curriculum Structure

S.Y. B. Tech. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SEM III & SEM IV

(Academic Year 2023- 2024)

Annasaheb Dange College of Engineering and Technology
Artificial Intelligence and Data Science Department
Teaching and Evaluation Scheme

S. Y. B. Tech Semester IV#

Course Code	Course Name	Teaching Scheme				THEORY							PRACTICAL						GRAND TOTAL
						ISE		MSE + ESE			Total	Min	ISE		ESE		Total	Min	
		L	T	P	Credits	Max	Min	MSE	ESE	Min			Max	Min	Max	Min			
1ADBS209	Statistics Probability and Fuzzy Logic	3	-	-	3	40	16	30	30	24	100	40	-	-	-	-	-	-	100
1ADPC210	Database Management Systems	3	-	2	4	40	16	30	30	24	100	40	50	20	50	20	100	40	200
1ADPC211	Data Analytics	2	-	2	3	40	16	30	30	24	100	40	50	20	-	-	50	20	150
1ADPE21*	Professional Elective - I	2	-	-	2	40	16	30	30	24	100	40	-	-	-	-	-	-	100
1ADAI216	Minor Course - 1 ^	2	-	-	2	50	20	30	30	24	100	40	-	-	-	-	-	-	100
1ADVS219	Web Technology	1	-	2	2	-	-	-	-	-	-	-	50	20	50	20	100	40	100
1ADHS218	Environmental Studies	2	-	-	2	50	20	-	-	-	50	20	-	-	-	-	-	-	50
1ADHS217	Universal Human Values	2	-	-	2	50	20	-	-	-	50	20	-	-	-	-	-	-	50
1ADEL220	Innovation / Prototype	-	-	2	1	-	-	-	-	-	-	-	50	20	-	-	50	20	50
1ADCC221	Aptitude and Reasoning Part - II	-	-	2	1	-	-	-	-	-	-	-	50	20	-	-	50	20	50
		17	**0**	**10**	**22**														**950**
	Total Contact Hours	**27**																	

All Students Should Undergo Inplant Training / Internship for a Minimum of 15 Days During the 4th Semester Vacation Period

^ Multi Disiplinary Minor

Professional Elective - I	
1ADPE212	Ethics in Artificil Intelligence and Data Science
1ADPE213	Microprocessors and Microcontrollers
1ADPE214	Sensors for Engineering Applications
1ADPE215	Advanced Data Structures

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Class	S Y B. Tech Sem IV
Course Code & Course Title	1ADBS209 **Statistics, Probability and Fuzzy Logic**
Prerequisite/s	-
Teaching Scheme (Lecture/ Tutorial /Practical)	3/0/0
Credits	3
Evaluation Scheme Theory: ISE/ MSE/ ESE	40/30/30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADBS209_1	Apply statistical techniques to interpret the given data.
1ADBS209_2	Solve given problems by using probability distribution
1ADBS209_3	Using test of hypothesis to assess plausibility of given sample data
1ADBS209_4	Construct different fuzzy sets using basic definitions of fuzzy sets.
1ADBS209_5	Use the extension principle on fuzzy numbers/sets to develop arithmetic operations

Course Contents:

Unit No.	Name of the Unit	Contact Hours
Unit 1	**Measures of Central Tendency:** Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode Partition values: Quartiles, Deciles and Percentiles	**06 Hrs.**
Unit 2	**Measures of Dispersion:** Concept of dispersion, Range, Quartile Deviation, Mean Deviation, Mean Square Deviation, Variance and Standard Deviation, Moments, Skewness by Karl Pearson's method, Kurtosis	**07 Hrs.**
Unit 3	**Probability Distribution** Random variable, Binomial Distribution, Poisson Distribution, Normal Distribution.	**06 Hrs.**
Unit 4	**Statistical Interference- Test of Hypothesis** Sampling distributions, Testing of Hypothesis, Level of Significance Testing of Significance for large sample, Testing of Significance for small sample: Students t-distribution and Chi- Square Test	**07 Hrs.**
Unit 5	**Introduction to Fuzzy sets.** Basic concepts of Fuzzy Sets, Crisp Set and Fuzzy Set, Membership Functions, Basic operations on fuzzy sets, Properties of fuzzy sets.	**07 Hrs.**
Unit 6	**Fuzzy Arithmetic** Fuzzy Numbers, Fuzzy Cardinality, Operations on Fuzzy Numbers, Fuzzy Equations of Type A + X = B and A.X = B.	**06 Hrs.**

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Text Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
01	Higher Engineering Mathematics	Dr. B. S Grewal	Khanna Publishers	44th	2018
02	A Text Book of Engineering Mathematics (For Unit 1)	N. P. Bali, Manish Goyal	Laxmi Publications(P) Ltd	8th	2011
03	Advanced Engineering Mathematics	H. K. Dass	S. Chand	22nd	2018
04	Fuzzy Sets & Fuzzy Logic Theory and Applications (For Unit 2 & 3)	George J. Klir and Bo Yuan	PHI Learning Private Limited	-	2013

Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
01	Probability and Statistics for Computer Science	James L. Johnson	Wiley	1st	2008
02	Probability and Statistics for Engineers	Dr. J. Ravichandran	Wiley	1st	2012
03	Advanced Engineering Mathematics	Erwin Kreyszig	Wiley Publishers	9th	2013
04	Fuzzy Logic with Engineering Applications	Timothy J. Ross	Wiley	3rd	2013

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Class	S Y B. Tech Sem IV
Course Code & Course Title	1ADPC210- **Database Management Systems**
Prerequisite/s	Data structures
Teaching Scheme (Lecture/ Tutorial /Practical)	3/0/2
Credits	4
Evaluation Scheme Theory: ISE/ MSE/ ESE	40/30/30
Evaluation Scheme Practical: ISE/ ESE	50/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADPC210_1	Explain different concepts of database and conceptual database design, relational algebraic SQL and normalization.
1ADPC210_2	Design ER model for given system and prepare the relational database schema for the using integrity constraints, validate it by applying different normalization techniques.
1ADPC210_3	Summarize SQL queries in pure languages to access essential information from the database.
1ADPC210_4	Describe file organization concepts of indexing for efficient system performance, transaction management and concurrency control.
1ADPC210_5	Use concepts of indexing, concurrency protocols and recovery algorithms with real-world examples.

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Introduction to databases and ER Model** **Introduction:** Introduction to database, advantages and applications, Database View - Levels of data abstraction, Data models, Database System Architecture. **ER Model:** Entity concept,Entity set, Relationship sets, Relationship types, Keys	06 Hrs.
Unit 2	**Relational Model and SQL** **Relational Model:**Relational model concept, Relational Database structure, Conversion of ER model into Relational schemas, Relational algebra queries **SQL:** Introduction to SQL, Data definition statements with constraints, Insert, Update and Delete, Set operations, Group by and having aggregate functions, clauses, Nested Queries, Joins.	07 Hrs.
Unit 3	**Functional Dependency and Normalization** Importance of a good schema, Motivation for normalization forms, Atomic domains and lNF, Dependency- functional dependencies, closure of a set of FD's, Concepts of 2NF, 3NF and BCNF, Decomposition algorithms, Multivalued dependencies, Join dependencies.	07 Hrs.
Unit 4	**Data Storage & Indexing** Data storage and its types, file organization, organization of records into files, Data Dictionary, Database Buffer **Indexing:**Concept, Ordered Indices-Primary, Secondary, Multilevel,	07 Hrs.

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	hashing, Hash Indices, Dynamic hashing.	
Unit 5	**Transaction Management & Concurrency Control** **Transaction Processing:** Transaction processing concept, ACID properties, Transaction states, Implementation of atomicity, isolation and durability, Serializability, **Concurrency Control:** Lock-based protocols, Timestamp - based Protocols, Validation -based Protocols, Deadlock handling.	07 Hrs.
Unit 6	**Recovery System** Failure classification, Storage structure, Implementation of stable and Atomicity, Log based recovery, Checkpoints, Shadow paging, crash recovery.	05 Hrs.

Expt. No.	Title of Experiment
1.	Drawing an E-R Diagram for any organization and Converting E-R diagram into Relational Tables.
2.	Installation and Demonstration of DBMS Oracle / MySQL / SQL Server / Postgre SQL etc.
3.	Study and Implementation of Data Definition Language (DDL) Queries (e.g. create, alter and drop tables).
4.	Study and Implementation of Data Manipulation Language (DML) Queries (e.g. insert, delete, update and select statements).
5.	Study and Implementation of Basic SQL SELECT statement for displaying / extracting data from single table or multiple tables.
6.	Study and implementation of SQL constructs for aggregating data, use of group by, having clauses.
7.	Study and implementation of nested sub-queries, complex queries, views and Joins.
8.	Study and Implementation of Triggers.
9.	Study and Implementation of Functions and Stored Procedures.
10.	Implementation of Database connectivity with object oriented language (Java).
11.	Few aspects of authorization such as creating and managing users, roles, granting and revoking of privileges etc.
12.	Creating Indices for the tables, implementing static hashing.
13.	Micro Project / Study of Transaction processing and concurrency control techniques.

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Database system concepts	A. Silberschatz, H.F. Korth, S. Sudarshan	McGraw Hill Education	6th	2011
2	Database Systems - Design, Implementation and Management	Rob & Coronel	Thomson Course Technology	5th	2008
3	Database Systems- A practical approach to Design, Implementation	Thomos Connolly, Carolyn Begg	Pearson Education	4th	2009

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Reference Books:					
Sr. No.	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1.	Database Systems: Design, Implementation and Management	Peter Rot'. Carlos Coronel	Cengage Learning	7th	2014
2.	Fundamentals of Database Systems	Ramez Elmasri and Shamkant Navathe	Pearson Education	4th	2007
3.	Principles of Database System	J. D. Ullman	Galgotia publications	1st	2011
4.	SQL: A Complete Reference	Alexis Leon, Mathews Leon	McGraw Hill Education	1st	2002

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Class	S Y B. Tech Sem IV
Course Code & Course Title	1ADPC211- **Data Analytics**
Prerequisite/s	Data structures, Python for Data Science
Teaching Scheme (Lecture/ Tutorial /Practical)	2/0/2
Credits	3
Evaluation Scheme Theory: ISE/ MSE/ ESE	40/30/30
Evaluation Scheme Practical: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADPC211_1	Understand the concept of sampling
1ADPC211_2	Apply the knowledge to derive hypotheses for given data
1ADPC211_3	Understand the concept of hypotheses
1ADPC211_4	Demonstrate the skills to perform various test on given data
1ADPC211_5	Analyze the ANOVA test in various samples
1ADPC211_6	Articulate the concept regression stats models

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**INFERENTIAL STATISTICS** Data analysis vs Data Analytics Types of analytics Diagnostic Analytics, Predictive Analytics, Prescriptive Analytics, Samples, Random sampling, probability and statistics, sampling distribution, Creating a sampling distribution, hypothesis, Types of hypothesis	5Hrs
Unit 2	**T-TEST** t-test for one sample, sampling distribution of t, t-test procedure, degrees of freedom, estimating the standard error, case studies t-test for two independent samples, sampling distribution, test procedure, p-value, estimating effect size, t-test for two samples	5Hrs
Unit 3	**ANALYSIS OF VARIANCE** F-test least ANOVA, estimating effect size ,multiple comparisons, Two-factor experiments ,three f-tests ,two factor-ANOVA ,other types of ANOVA	4Hrs
Unit 4	**PREDICTIVE ANALYTICS** Linear least squares, Implementation, goodness of fit, testing a linear model, weighted resampling Regression using stats models, multiple regression, logistic regression, Time series analysis	4Hrs
Unit 5	**ESTIMATION THEORY** Unbiased estimators – Method of moments – Maximum likelihood estimation - Curve fitting by principle of least squares.	4Hrs
Unit 6	**APPLICATION OF ANALYTICS** Web Analytics-Basics, URLS-Cookies, search Analytics –Internal search, SEO and PPC Health care Analytics –Advanced data analytics for health care, computer assisted medical image analysis system, Mobile Imaging and analytics for biomedical data	4Hrs

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Course Contents:	
1	Download, install and explore the features of, Jupyter environment
2	Download, install and explore the features of, colab environment, understand the Anaconda
3	Working with Numpy arrays
4	Working with Pandas data frames
5	Perform various types of data cleaning operations on the data collected in previous lab using data exploration, imputation etc.
6	Perform dimensionality reduction on a given dataset and create various visualizations like histograms, scatter-plots, etc.
7	Implement Linear and logistic Regression
8	Perform association analysis on a given dataset and evaluate its accuracy.
9	Build a recommendation system on a given dataset and evaluate its accuracy.
10	Build a time-series model on a given dataset and evaluate its accuracy.
11	Build cartographic visualization for multiple datasets involving various countries of the world; states and districts in India
12	Micro Project / Apply and explore various plotting functions on UCI data sets. a. Normal curves b. Density and contour plots c. Correlation and scatter plots

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Statistical inference for data science	Brain Cuffo	Lean pub	-	2016
2	statistics" 11TH Edition	Robert S Witte John S.Witte	Wiley publication	-	2017
3	Think stats: Exploratory data analysis in python	Allen B.Downey	Green tea press	-	2014
4	Web Analytics The Art of Online Accountability and Science Of Customer	Avinash Kaushik	Centricity, Sybex	1st edition	2009
5	Data Science Fundamentals and Practical Approaches	Gypsy Nandi, Rupam Sharma	BPB Publications	-	2020.
6	The Data Science Handbook	Field Cady, John Wiley & Sons			2017

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Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1	Python data science hand book	Jake Vanderplas	O Reilly	-	2016
2	Big Data Analytics made easy	Dr.Laxmi Prasad	Notion Press	-	2016
3	Healthcare data analytics	Chandan K Reddy and Charu C Agarwal	Tayor & Francis	-	2015
4	A Semantic Web Primer	Paul Groth, Frank van Harmelen, Rinke Hoekstra,	MIT press	Third edition	2012

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Class	S Y B. Tech Sem IV
Course Code & Course Title	1ADPE212 **Ethics in Artificial Intelligence and Data Science**
Prerequisite/s	Design Thinking
Teaching Scheme (Lecture/ Tutorial /Practical)	2/0/0
Credits	2
Evaluation Scheme Theory: ISE/ MSE/ ESE	40/30/30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADPE212_1	Explain Responsibility in the ethics of technology for privacy
1ADPE212_2	Analyze anonymity and data validity with the help different case studies.
1ADPE212_3	Explain algorithmic fairness and Societal Consequences and Code of Ethics
1ADPE212_4	Design ethical frameworks for different real-life applications
1ADPE212_5	Discuss issues and challenges regarding AI policies

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Introduction to Ethics** What are Ethics,History, Concept of Informed Consent, Data Ownership **Introduction to Ethics of AI,** Responsibility in the ethics of technology	04 Hrs.
Unit 2	**Privacy** Privacy, History of Privacy, Degrees of Privacy, Modern Privacy Risks, Case Study: Targeted Ads, Sneaky Mobile Apps	04 Hrs.
Unit 3	**Anonymity and Data Validity** Anonymity, De-identification Has Limited Value, Case Study: Credit Card Statements, Validity, Choice of Attributes and Measures, Errors in Data Processing, Errors in Model Design, Case Study: Three Blind Mice, Case Study: Algorithms and Race, Case Study: Algorithms in the Office,	05 Hrs.
Unit 4	**Algorithmic Fairness** Algorithmic Fairness, Correct but Misleading Results, P Hacking, Case Study: High Throughput Biology, Case Study: Geopricing, Case Study: Your Safety Is My Lost Income **Societal Consequences and Code of Ethics** Societal Impact, Ossification, Surveillance, Case Study: Social Credit Scores, Case Study: Predictive Policing, Code of Ethics, Case Study: Algorithms and Facial Recognition	05 Hrs.
Unit 5	**Case-studies, examples and ethical frameworks** Ethics of autonomous vehicles, Autonomous weapons and the digitalization of conflicts, Digital medicine, Sustainability and	04 Hrs.

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	environmental impact, Cybersecurity and AI	
Unit 6	**Issues and challenges** Human decisions and AI, Human decisions and AI, what is the value of privacy in information society, what is the value of privacy in information society, Moralizing technologies, Governance and policies **AI policies** Ethics of AI: a paradigmatic change	04Hrs.

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Artificial Intelligence - The Practical Legal Issues	Buyers John	Law brief publishing	2nd Edition	2019
2	The Ethics of AI	Alberto Chierici	Atlantic	1st	2021

Other Books/E-material

Sr. No	Title	Author	Publisher
01	Coursera video lectures	Coursera Author	https://www.coursera.org/learn/ethics-of-artificial-intelligence
02	Coursera video lectures	Coursera Author	https://www.coursera.org/learn/data-science-ethics

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Class	S.Y.B.Tech Sem IV
Course Code & Course Title	1ADPE213 **Microprocessors and Microcontrollers**
Prerequisite/s	Analog Electronics, Digital Electronics
Teaching Scheme (Lecture/ Tutorial /Practical)	2/0/0
Credits	2
Evaluation Scheme Theory: ISE/ MSE/ ESE	40/30/30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADPE213_1	**Explain** the architecture of 8085, 8051 and PIC16f877 to understand PIN configuration of each processor.
1ADPE213_2	**Compare** microprocessor and microcontrollers for analyzing interfacing between peripheral devices.
1ADPE213_3	**Design** Pin description of 8051 microcontroller to understand the internal design and features of 8051 microcontroller by using advanced simulator.
1ADPE213_4	**Interface** stepper motor, DC motor and on board peripheral to communicate with 8051 and PIC using trainer kit.
1ADPE213_5	**Write** programs over 8085 microprocessor, 8051 and PIC microcontroller in assembly and C using instruction set.

Course Contents:

Sr. No.	Unit Name	Contact Hours
Unit 1	**Microprocessor Architecture and Microcomputer System** Microprocessor Architecture and its operation- Microprocessor initiated operations, internal operation, and Peripheral operation. Memory-,memory classification, Input and output devices.	4Hrs
Unit 2	**8085 Microprocessor Architecture** The 8085 MPU, Microprocessor communication and bus timing, De-multiplexing address and Data bus, Generating control signals, The 8085Architecture, and 8085 based microcomputer-machine cycles and bus timing, op-code fetch machine cycle,	4Hrs
Unit 3	**8085 assembly language programming** The 8085 programming model, instruction classification, instruction and data format, Writing and execution of assembly language program. The 8085 instruction-data transfer operations, addressing modes, Arithmetic operation, Flag concept and cautions, Logic operations, Branch operations.	5Hrs
Unit 4	**Introduction to 8 Bit Microcontroller 8051** Difference between general purpose microprocessor and microcontrollers, Introduction to MCS51family, Architecture of 8051, Functional pin out diagram of 8051, Reset circuit, Machine cycle, oscillator circuit, programming model, memory organization, instruction set, addressing modes, assembly language programming, Boolean instructions.	4Hrs

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Unit 5	**Architecture of PIC microcontroller & instruction set** CPU architecture: Harvard architecture & pipelining, program memory considerations, register file structure, instruction set, addressing modes: immediate, direct, Indirect CPU registers: status word, FSR, INDF, PCLATH, PCL, assembly language programming, Pin diagram of 16f8xx,features of PIC	5Hrs
Unit 6	**Embedded 'C' Programming for 8051** Introduction to compiler, assembler, debugger, interpreter, C data types, I/O programming, programming for LCD, LED, DC motor , stepper motor using embedded 'C'	4Hrs

Text Books:

Sr. No	Title	Author	Publisher	Edition	Yearof Edition
1	Microprocessor Architecture – programming and applications with 8085	Ramesh Gaonkar	Penram International	4th	2007
2	The INTEL Microprocessors - Architecture,Programming and Interfacing	Barry B. Brey S	PHI Ltd	8th	2010
3	The 8051 Microcontroller and Embedded systems using assembly and C	Mazidi& D Mackinlay	Pearson Education	2nd	2011
4	Design with PIC microcontrollers	John B Peatman	Pearson Education	1st	2012

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Microprocessors and Microcontrollers	N. Senthi Kumar, M. Saravanan and S. Jeevananthan	Oxford University Press	2nd	2001
2	Microprocessor 8086: Architecture, Programming and Interfacing	Mathur Sunil	PHI Publication	4th	2011
3	8051 Microcontroller	Subrata Ghoshal	Pearson Education	1st	2010
4	8051 microcontroller	Kenneth J Ayala	Cencage Learning	3rd	2012

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Class	S Y B. Tech Sem IV
Course Code & Course Title	1ADPE214 **Sensors for Engineering Applications**
Prerequisite/s	Analog electronics, Digital electronics
Teaching Scheme (Lecture/ Tutorial /Practical)	2 / 0 / 0
Credits	2
Evaluation Scheme Theory: ISE/ MSE/ ESE	40/30/30

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1ADPE214_1	Identify sensors, actuators, Micro sensors and Micro actuators to solve a problem using sensor fundamentals and its characteristics.
1ADPE214_2	Use Micro sensors and Micro actuators to solve the problems in different scenarios using Arduino IDE.
1ADPE214_3	Design a solution for given problem using sensors and ESP32 with Arduino IDE.
1ADPE214_4	Design sensor system for real world applications using Raspberry Pi.
1ADPE214_5	Connect sensors and actuators with ESP32 to solve a problem using pin description of ESP32 microcontroller.

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Sensor fundamentals and Characteristics** Introduction, Basic principles of sensor, sensor classification, Understanding various sensors, sensor selection and characteristics: Range, resolution, sensitivity, error, precision, repeatability, linearity and accuracy, impedance response time and backlash, Performance measures of sensors.	4 Hrs.
Unit 2	**Types of sensors and their applications** Temperature sensor, Proximity sensors, Infrared sensor, Ultrasonic sensor, Light sensor, Smoke and Gas sensor, Alcohol sensor, Humidity sensor, automobile sensor, home appliance sensors. Real time application of sensors, Technologies related to sensors: Metal detector, Global Positioning system, Blood Glucose monitoring, Photoelectric sensor.	4 Hrs.
Unit 3	**Actuators** Definition, types and selection of Actuators, working principle of actuators, Linear actuators, Rotary actuators, Logical and continuous actuators, Pneumatic actuator, Hydraulic actuators- control valves, Electrical actuating system: solid state switched, solenoids, electric motors- principle of operation and its application, DC motors, AC motors, Synchronous motors, Stepper motors.	5 Hrs.
Unit 4	**Micro Sensors and Micro Actuators** Micro Sensors: Principles and examples, Force and pressure micro sensors, position and speed micro sensors, acceleration micro sensors, chemical sensors, biosensors, temperature micro sensors and flow micro	5 Hrs.

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	sensors. Micro Actuators: Actuation principle, shape memory effects-one way, two way and pseudo elasticity. Types of micro actuators	
Unit 5	**Introduction to ESP32 and Raspberry Pi** Overview of ESP32 and its features, Block diagram of ESP32, Specifications, Layout, Pin description for ESP32, Introduction to Raspberry Pi.	4 Hrs.
Unit 6	**Case Studies** Sensors and actuators in Smart cities, Agriculture, Health Care, Activity Monitoring, Weather monitoring system, Forest fire detection.	4 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Sensors and Actuators in Mechatronics, Design and Applications	Andrzej M. Pawlak	CRC Press, Taylor & Francis group	1st	2007
2	Hand Book of Modern Sensors: Physics, Designs and Application	Jacob Fraden	Springer	5th	2016
3	Sensors and Transducers	Patranabis. D	Wheeler publisher	4th	1994

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Mechatronic systems, Sensors and Actuators Fundamentals and Modelling	Robert H. Bishop	Taylor & Francis Group	1st	2006
2	Micro actuators Electrical, Magnetic, thermal, optical, mechanical, chemical and smart structures	MassoodTabib and Azar	Kluwer academic publishers, Springer	1st	1997
3	Microsystem Technology and Microbotics	SergejFatikow and Ulrich Rembold	Springer	1st	1997
4	ESP32 web server with Arduino IDE, step–by-step project guide	Rui Santos and Sara Santos	-	-	-

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Class	S Y B. Tech Sem IV
Course Code & Course Title	1ADPE215 **Advanced Data Structures**
Prerequisite/s	Data Structures
Teaching Scheme (Lecture/ Tutorial /Practical)	2/0/0
Credits	2
Evaluation Scheme Theory: ISE/ MSE/ ESE	40/30/30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADPE215_1	Describe various advanced data structure techniques such as advanced linked list, advanced trees, graphs.
1ADPE215_2	Describe various hashing techniques and collision resolution techniques.
1ADPE215_3	Demonstrate the knowledge of advanced data structures in solving problems.
1ADPE215_4	Analyze the algorithms and compare the working of various data structures.
1ADPE215_5	Evaluate the performance of various data structures with help of different case studies.

Course Contents:		
Unit 1	**Advanced Linked List** Memory Efficient Doubly Linked List, XOR Linked List, Skip List, Self-Organizing List	**4Hrs.**
Unit 2	**Advanced Trees** Segment Tree, Binary Indexed Tree, Binary Search Tree, Self-Balancing BST, Red Black Tree, Splay Tree	**5 Hrs.**
Unit 3	**Data Structure Transformations** Making Structures Dynamic, Making Structures Persistent **Data Structures for Strings** Tries and Compressed Tries, Dictionaries Allowing Errors in Queries, Suffix Trees,	**4 Hrs.**
Unit 4	**Graph Problem**: Edge Coloring, Vertex coloring, Max flow- mincut theorem, Probabilistic models	**4 Hrs.**
Unit 5	**Dynamic Graphs**: Link Cut Trees, Preferred Path Decomposition, Dynamic Connectivity, Euler Tour Trees.	**4 Hrs.**
Unit 6	**Hashing** Hashing, Hashing techniques, Open Addressing for Collision Handling. Index Mapping, Collision resolution techniques, Cuckoo Hashing	**5 Hrs.**

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Text Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
01	Introduction to Algorithms	Thomas H Cormen, Charles Leiserson, Ronald Rivest	PHI	3rd	2009
02	Computational Geometry- Algorithms and Application	Mark De Berg, Otfried Cheong, Marks Overmars	Springer	3rd	2008
03	Advanced Data Structure	Erik Demaine	MIT Open Courseware	-	-

Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
01	Computational Geometry in C	Joseph O'Rourke	Cambridge University Press	-	-
02	Graph Theory	Reinhard Diestel	Spinger-Verlag	-	2000
03	Advanced Data Structures	Peter Brass	Cambridge University Press	-	-

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Class	S Y B. Tech Sem IV
Course Code & Course Title	1ADAI216 **Foundations of Artificial Intelligence (Minor course-I)**
Prerequisite/s	Problem Solving Using C
Teaching Scheme (Lecture/ Tutorial /Practical)	2/0/0
Credits	2
Evaluation Scheme Theory: ISE/ MSE/ ESE	40/30/30

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
1ADAI216_1	Understand the basics of Artificial Intelligence
1ADAI216_2	Develop fundamental understanding of different problem-solving methods and search strategies
1ADAI216_3	Apply Knowledge Representation and Planning in Knowledge based systems
1ADAI216_4	Demonstrate ideas behind software agents to solve a problem
1ADAI216_5	Design applications for NLP that use Artificial Intelligence

Course Contents:		
Unit No.	**Unit Name**	**Contact Hours**
Unit 1	**AI Introduction** Introduction – Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to AI problems.	04 Hrs.
Unit 2	**PROBLEM SOLVING METHODS** Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Constraint Satisfaction Problems (CSP) - Backtracking Search - Optimal Decisions in Games – Alpha - Beta Pruning -Games that include an element of chance.	05 Hrs.
Unit 3	**SOFTWARE AGENT SYSTEMS** Introduction to Logical Agents, Uncertainty-Probability -Inference-Independence and Bayes' Rule- Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining	04 Hrs.
Unit 4	**KNOWLEDGE REPRESENTATION** First order logic, Syntax and semantics for first order logic, Knowledge engineering in first order logic, Inference in First order logic, prepositional versus first order logic– Unification and Lifting – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation	05 Hrs.

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Unit 5	**Planning** Classical Planning- algorithms for Classical Planning- Heuristics for planning- hierarchical planning- non-deterministic domains- time, schedule and resources- analysis	04hrs
Unit 6	**APPLICATIONS** AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot	04 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Artificial Intelligence –A Modern approach	Stuart J. Russell, Peter Norwig,	Pearson Education	3rd	2016
2	Artificial Intelligence	Elaine Rich and Kevin Knight	Tata McGraw Hill Publishing Company, New Delhi,	-	2014

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Prolog: Programming for Artificial Intelligence,	I. Bratko	Addison-Wesley Educational Publishers Inc.,.	Fourth edition	2015
2	The Quest for Artificial Intelligence	Nils J. Nilsson	Cambridge University Press	6th	2013
3	Artificial Intelligence: Foundations of Computational Agents	David L. Poole and Alan K. Mackworth	Cambridge University Press	-	2012
4	Multi Agent Systems	Gerhard Weiss	MIT Press	Second Edition	2013

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Class	S.Y, B. Tech, Semester. -IV
Course Code and Course Title	1ADHS217 **Universal Human Values**
Prerequisite/s	Students Induction Program (SIP)
Teaching Scheme: Lecture/Tutorial	02 / 00
Credits	02
Evaluation Scheme Theory: ISE	50

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1ADHS217_1	**Integrate** the process of self-exploration to achieve Harmony in the human being's based on Holistic perspective of value education.
1ADHS217_2	**Understand** Harmony in human being, family, society and nature /existence, based on methods to fulfill human aspiration.
1ADHS217_3	**Apply** the human values for maintaining the relationships with oneself and others using the principals of harmony.
1ADHS217_4	**Adopt** the methods of maintaining harmony with the society, nature, and its existence by utilizing the human order systems.

Course Contents:

Sr. No.	Unit Name	Contact Hours
Unit 1	**Introduction to Value Education** Introduction, Need, Purpose and motivation for the course, recapitulation from Universal Human Values-I **Self-Exploration**–what is it? - Its content and process; 'Natural Acceptance' and **Experiential Validation**- as the process for self-exploration. **Continuous Happiness and Prosperity-** A look at basic Human Aspirations, **Right understanding**, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority.	4Hrs
Unit 2	**Understanding Happiness and Prosperity** **Understanding Happiness** and Prosperity correctly, **Prevailing sources of happiness,** Prosperity and its implications Method to fulfil the human aspirations: understanding and living in harmony at various levels.	4Hrs
Unit 3	**Understanding Harmony in the Human Being - Harmony in Myself** **Understanding human** being as a co-existence of the sentient 'I' and the material 'Body', **Understanding the needs of Self ('I') and 'Body'** - happiness and physical facility **Understanding the Body as an instrument of 'I'**	5Hrs

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	(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, meaning of Prosperity in detail, Programs to ensure Sanyam and Health.	
Unit 4	**Understanding Harmony in the Family - Harmony in Human-Human Relationship** **Understanding values in human-human relationship**; meaning of Justice (nine universal values in relationships) and program for its fulfilment 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; **Peer Pressure** the Concerns and its Resolution the other salient values in relationship.	6Hrs
Unit 5	**Understanding Harmony in the Society** **Understanding the harmony in society**: Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals **Human order systems** and dimensions	4Hrs
Unit 6	**Understanding Harmony in the Nature and Existence** **Understanding the harmony in the Nature,** Inter-connectedness and mutual fulfilment among the four orders of nature, recyclability and self-regulation in nature	3Hrs

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Understanding Human Being, Nature and Existence Comprehensively	UHV Team	UHV	1st	2022
2	A Foundation Course in Human Values and Professional Ethics	R. R. Gaur, R Asthana,G P Bagaria	Excel Books	2nd	2019
3	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics	R. R. Gaur, R Asthana, G P Bagaria	Excel Books	2nd	2019
4	Human Values	A.N Tripathy	New Age International	2nd	2006

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Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1	A Foundation Course in Human Values and Professional Ethics	R.R. Gaur, R. Sangal, G.P. Bagaria	Excel Books	3rd	2010
2	Indian Ethos and Modern Management: Amalgam of the Best of the Ideas from the East and the West	B.L. Bajpai	New Royal Book	1st	2004
3	Small Is Beautiful	E. FSchumacher	Hartley & Marks	1st	1999
4	An Introduction to Ethics	William Lilly	Allied	1st	1967

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Class	S. Y. B. Tech, Sem.-IV
Course Code and Course Title	1ADHS218 **Environmental Studies**
Prerequisite/s	--
Teaching Scheme: (Lecture/ Tutorial /Practical)	2/0/0
Credits	2
Evaluation Scheme Theory: ISE	50

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1ADHS218_1	**Comprehend** the concepts and principles of sustainable development and its importance in environmental preservation.
1ADHS218_2	**Explain** ethical and legal responsibility of an engineer and his role in effective implementation of sustainable activities through EIA and EMS in the corporate sector.
1ADHS218_3	**Predict** impact of contemporary issues (Population Explosion, Climate change, Environmental pollution) on the environment.
1ADHS218_4	**Classify and analyze** different types of environmental pollution, understand their causes and effects, and propose control measures.
1ADHS218_5	**Prepare** a technical report highlighting importance of environment in human life by using techniques like survey, case studies, mini project.

Course Contents:
The main objective of the course is to infuse an understanding of the various environmental concepts on scientific basis in the functional area of Engineering and technology. The course will provide a foundation to critically assess the approaches to pollution control, environmental and resource management, sustainable development, cleaner technologies, Environmental Legislation based on an understanding of the fundamental, environmental dimensions. The course will help to explore the modern concept of green industry and the impact of excess human population, globalization, and climate change on the environment.

Unit No.	Title	Hrs.
Unit 1	**Introduction to Environment and concept of Sustainable development:** Natural and Built Environment, Environmental Education: Definition, Scope, Objectives and importance. Components of the Environment: Atmosphere, Hydrosphere, Lithosphere and Biosphere. Biological Diversity: Introduction, Values of biodiversity, Threats to biodiversity, Conservation of biodiversity. Sustainable development goals, pillars of sustainable development.	4Hrs
Unit 2	**Energy and Natural Resources** Energy Scenario: Conventional Energy Sources and Non- Conventional Energy Sources, Urban problems related to energy. Future projections of Energy Demand, Utilization of various Energy Sources. Natural Resources: Food, Water, Forest, Geological, Equitable Use of Resources for Sustainable lifestyle. Concept of life cycle analysis.	5Hrs
Unit 3	**Introduction to global environmental issues, Impact of modernization** Climate change: Global warming, Ozone depletion, Acid Rain etc. Environmental Impact: Impact of Modern agriculture on the Environment, Impact of Mining on the Environment, Impact of modern development on the Environment. Case study.	4Hrs

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Unit 4	**Environmental Pollution and control measures** Definition, Causes, effects and control measures of, Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. E waste management. Role of an individual in prevention of pollution.	5Hrs
Unit 5	**Environmental Management and Legislation** Environmental ethics: Introduction, Ethical responsibility, issues and possible solutions. Environmental Management: Introduction to Environmental Impact Assessment, Environmental Management System: ISO 14001Standard, Environmental Auditing, National and International Environmental protection agencies pertaining to Environmental Protection. Introduction to Environmental Legislation.	4Hrs
Unit 6	**Cleaner technology:** Consumerism and Waste Products, Green buildings, Green products, Minimization of Hazardous Products, Reuse of Waste, By-products, Rainwater Harvesting, Translocation of trees. Some Success Stories. Role of Information Technology in Environment protection.	4Hrs

Assessment methods:

01. Mini Project (in a group of 4 to 5 students): **15 marks**

Mini Project should based upon:

a. Recent technology relevant to Environment protection

OR

b. Case study on polluted sites…. Urban/Rural/Industrial/Agricultural

OR

c. Life cycle analysis of any product.

(Mini project report submission is mandatory)

02. Seminar : **10 Marks**

Topic should be from the content of the course.

Text Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Environmental Studies	Anindita Basak	PEARSON	First edition	2017
02	Environmental Studies	N.K Uberoi	Excel Books Publications New Delhi,	First edition	2005.
03	Environmental Studies from crisis to cure	R. Rajagopalan	Oxford university press,	Second edition	2011

Reference Books / Handbooks

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Environmental Science:	William Cunningham	WCB/McGraw	Fifth	1999

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Class	S Y B. Tech Sem III
Course Code & Course Title	1ADVS219 **Web Technology**
Prerequisite/s	OOP, Database management
Teaching Scheme (Lecture/ Tutorial /Practical)	1/0/2
Credits	2
Evaluation Scheme Practical: ISE/ESE	50/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADVS219_1	Construct a basic website using HTML and CSS.
1ADVS219_2	Design a web application for different sized screens using Bootstrap ,Javascript and ReactJS
1ADVS219_3	Develop a web application for given problem statement using NodeJs, ExpressJS and MongoDB.
1ADVS219_4	Plan, develop, debug, and implement interactive client□side and server□ side web applications for real time problems using client side and serverside web techniques.
1ADVS219_5	Build scalable web apps quickly and efficiently using appropriate toolkits and framework.

Course Contents:		
Unit 1	**Responsive web design with HTML5** HTML5 Basics, Tables, Lists, Working with Link, Image Handling, Frames, iFrame, HTML Forms for user Input, New Form Elements, HTML5 Client-Side Storage	04 Hrs
Unit 2	**CSS3** CSS-Introduction, CSS-Syntax, CSS-Text Fonts, CSS-Lists Tables, CSS-Box Model , CSS-Display Positioning, CSS-Floats, Color, Gradients, Background Images, and Masks, Border and Box Effects, Working with Colors, Layout: Columns, Flex Box, Implementing CSS3, Transforms, Transitions, and animations	04 Hrs
Unit 3	**Bootstrap and JavaScript** Introduction to Bootstrap, Bootstrap Grid, Bootstrap, Components, Bootstrap Plugins, JavaScript Fundamentals BOM (Browser Object Model),DOM (Document Object Model),AJAX Development, Typescript, MotionUI.	05 Hrs.
Unit 4	**ReactJS** React Introduction, React Essential Features and Syntax, React Components, Props and State, Styling Components, Debugging React Apps, React Component lifecycle ,React Component in Details, HTTP Requests/AJAX Calls, React Routing, React Forms and Form Validation, Deploying React App to the Web Testing React apps with JEST.	04Hrs.
Unit 5	**NodeJS** Introduction to NodeJS, Setup Dev Environment, Event Loop, Node JS Modules, Node Package Manager, Creating Web server, File System, Debugging Node JS Application Events.	05Hrs.

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	ExpressJs, Routing, Template engines, Middleware, Web Application components, Error handling, Testing application Express application.	
Unit 6	**MongoDB** MongoDB – Overview, CRUD Operations, Basic Operations, Aggregations, Indexing, Replication and Sharding.	04 Hrs.

Experiment List:	
1	Programs based on newly introduced elements of HTML5.
2	Programs based on Typography and background properties of CSS3, animation effect by using the transition feature of CSS.
3	Programs based on JavaScript operators, functions and objects.
4	Programs based on Jquery selectors, Jquery events.
5	Program to demonstrate concept of DTD and its types.
6	XSLT styles-sheet to convert XML document to HTML.
7	program to implement PHP variables, Expression, arrays, control structure
8	Design a web form and validate it using PHP using regular expressions
9	Design a web page to perform CRUD operations on MySQL database using PHP
10	Write a program to manage session in PHP
11	Installation of CMS and designing web pages using CMS.
12	Micro project / CMS theming and plugins

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Advanced Internet Technology	Deven Shah	Dreamtech Press	1st	2015
02	XML in a Nutshell	ElliotteRustyHarold, W. Scott Means	O'Reilly Publication	3rd	2004
03	Web Technologies: Black book	Kogent Learning Solutions Inc.	Dreamtech Press	1st	2009
04	Web Content Management	Deane Barker	O'Reilly Media	1st	2016

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Learning PHP, MySql, Java Script, CSS and HTML5	Robin Nixon	O'really	3rd	2014
02	Learning PHP, MySql, Java Script with JQuery, CSS and HTML5	Robin Nixon	O'really	4th	2012

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Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
03	Search Engine Optimization All-in-One for Dummies	Bruce Clay	John Wiley & Sons	3rd	2015
04	Learning Responsive Web Design: A Beginner's Guide	Clarissa Peterson	O'Reilly Media, Inc.	1st	2014

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Class	S Y B. Tech Sem IV
Course Code & Course Title	1ADEL220 **Innovation/ Prototype**
Prerequisite/s	Design Thinking
Teaching Scheme (Lecture/ Tutorial /Practical)	0/0/2
Credits	1
Evaluation Scheme Practical: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADEL220_1	Proficiently Apply the innovative thinking techniques to empathize the customer through arranging survey and/or interview
1ADEL220_2	Accurately Identify and Formulate the solution for real world problem using innovative technique
1ADEL220_3	Proficiently Create and Exhibit Prototype, for defined real world problem using innovative approach
1ADEL220_4	Accurately Comply &Test developed prototype for defined real world problem to meet user's requirements
1ADEL220_5	Routinely Adapt professional skills and ethical practices to provide a reliable solution for defined real world problem through participating in team activities

Course Contents:		
Unit 1	**Design thinking for innovation** Introduction of design thinking process, innovation and their role, Process of thinking in right direction, Incubation, Final ideation, Brain Storming, Psychological aspect of creativity.	26 Hrs
Unit 2	**Human and Culture Centered Design** Design for Society, better existing design, Design for change Cultural change, social change, Life style change	
Unit 3	**Visual communication and sketching** Anyone can sketch, expression of thinking and problem solving through sketch and graphic design	
Unit 4	**Prototyping & Fabrication** Process of Prototype design, Problems of different stages in prototype design, refines Prototype, Finalize Prototype	
Unit 5	**Engineering aspect of design** Electrical, Mechanical, Design, Material, Aspect, Safety and Reliability aspect	
Unit 6	**Introduction of Startup with entrepreneurship approach:** What is entrepreneurship, being an entrepreneurship, Challenges and possibilities of Entrepreneurship? How to Start up, Start-up Fundamental, Being Successful.	

Experiments:
8-10 experiments based on above topics will be conducted

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Text Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
01	Understanding Design Thinking, Lean, and Agile	Jonny Schneider	O'Reilly	---	2017
02	Engineering Design	John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson	Cengage learning	2nd	2013.
03	Design for How People Think	John Whalen	O'Reilly	---	2019

Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
01	Creative Confidence: Unleashing the Creative Potential Within Us All	Kelley, D. & Kelley, T	New York: William Collins	--	2014
02	The Design of Business: Why Design Thinking is the Next Competitive Advantage	Roger Martin	Harvard Business Press	--	2009
03	Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School	Idris Mootee	John Wiley & Sons	--	2013

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Class	S Y B. Tech Sem IV
Course Code & Course Title	1ADCC221 **Aptitude and Reasoning Part-II**
Prerequisite/s	Basic mathematics
Teaching Scheme (Lecture/Tutorial/ Practical)	0/0/2
Credits	1
Evaluation Scheme Practical: ISE	50

Course Outcomes (COs) : The students will be able to:	
1ADCC221_1	**Solve** problems based on HCF, LCM, Interest, Clock, Cubes and Puzzles
1ADCC221_2	**Solve** problems based on Coding and Decoding, Seating Arrangements and Venn diagrams.
1ADCC221_3	**Solve** problems based on Ratio Proportion, Partnership, Allegation, Divisibility and Number Theory
1ADCC221_4	**Demonstrate** presentations using concepts delivered on confidence building and time management skills.

Course Contents		
Unit No	**Unit Name**	**Contact Hours**
Unit 1	HCF LCM, Simple Interest, Compound Interest	**4 Hrs**
Unit 2	Coding- Decoding, Seating Arrangement Venn Diagrams	**4 Hrs**
Unit 3	Clocks, Cubes, Puzzles,	**4 Hrs**
Unit 4	Ratio Proportion, Partnership	**4 Hrs**
Unit 5	Confidence Building, Time Management	**4 Hrs**
Unit 6	Allegation, Divisibility and Number Theory	**4 Hrs**
	Self-Study Module	**6 Hrs**

Text Books:						
Unit No					**Unit Name**	**Contact Hours**
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**	**Sr. No**
1	R.S. Agarwal (Quantitative aptitude)	R.S.Agarwal	S Chand	-	2019	1
2	R.S. Agarwal (Verbal & Non-verbal Reasoning)	R.S.Agarwal	S Chand	-	2010	2

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3	Wren & Martin (Verbal, Grammar)	P.C.Wren	S Chand	-	2017	3

Reference Books:						
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**	**Sr. No**
1	APTIPEDIA (Quantitative, Logical, Verbal Aptitude)	Face	Wiley	-	2017	1
2	Wiley (Quantitative Aptitude)	P.A.Anand	Maestro	-	2015	2

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Curriculum Structure

T.Y B.Tech. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SEM V & SEM VI

(Academic Year 2024- 2025)

Artificial Intelligence and Data Science Department

Teaching and Evaluation Scheme

T. Y. B. Tech Semester V *^

Course Code	Course Name	Teaching Scheme				THEORY							PRACTICAL						GRAND TOTAL
						ISE		MSE + ESE			Total	Min	ISE		ESE		Total	Min	
		L	T	P	Credits	Max	Min	MSE	ESE	Min			Max	Min	Max	Min			
1ILOE3**	Open Elective - I	3	-	-	3	50	20	-	-	-	50	20	-	-	-	-	-	-	50
1ADPC301	Design and Analysis of Algorithms	3	-	2	4	40	16	30	30	24	100	40	50	20	50	20	100	40	200
1ADPC302	Data Exploration and Visualization	2	-	2	3	40	16	30	30	24	100	40	50	20	50	20	100	40	200
1ADPC303	Machine Learning	3	-	2	4	40	16	30	30	24	100	40	50	20	-	-	50	20	150
1ADHS304	Entrepreneurship	-	-	2	1	50	20	-	-	-	50	20	-	-	-	-	-	-	50
1ADAI305	Minor Course - 2 ^ Python Programming	3	-	-	3	40	16	30	30	24	100	40	-	-	-	-	-	-	100
1ADPE3**	Professional Elective - II	2	-	2	3	-	-	-	-	-	-	-	50	20	-	-	50	20	50
1ADEL310	Inplant Training / Internship	-	-	-	1	-	-	-	-	-	-	-	50	20	-	-	50	20	50
1ADCC311	Aptitude and Reasoning Part - III	-	-	2	1	-	-	-	-	-	-	-	50	20	-	-	50	20	50
		16	0	12	23														900
	Total Contact Hours	28																	

* Industrial Inplant Training / Internship Assesment should to be carried out during this semeser

^ Minor courses project work continuously assessed from Semester V. The final submission will at VIII semester

Professional Elective - II	
1ADPE306	Data science using R
1ADPE307	Software Engineering & Testing
1ADPE308	IoT Embedded systems for AI
1ADPE309	Data Annotations

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Artificial Intelligence and Data Science Department

Teaching and Evaluation Scheme

T. Y. B. Tech Semester VI

Course Code	Course Name	Teaching Scheme				THEORY							PRACTICAL						GRAND TOTAL
						ISE		MSE + ESE			Total	Min	ISE		ESE		Total	Min	
		L	T	P	Credits	Max	Min	MSE	ESE	Min			Max	Min	Max	Min			
1ILOE3**	Open Elective - II	3	-	-	3	50	20	-	-	-	50	20	-	-	-	-	-	-	50
1ADPC312	Computer Vision	3	-	2	4	40	16	30	30	24	100	40	50	20	50	20	100	40	200
1ADVS313	Cloud Computing	2	-	2	3	40	16	30	30	24	100	40	50	20	50	20	100	40	200
1ADPC314	Deep Learning	3	-	2	3	40	16	30	30	24	100	40	50	20	-	-	50	20	150
1ADPE3**	Professional Elective - III	3	-	-	3	40	16	30	30	24	100	40	-	-	-	-	-	-	100
1ADAI319	Minor Course - 3 ^ Information Retrieval	3	-	-	3	40	16	30	30	24	100	40	-	-	-	-	-	-	100
1ADEL320	Mini Project	-	-	4	2	-	-	-	-	-	-	-	50	20	-	-	50	20	50
1ADCC321	Aptitude and Reasoning Part - IV	-	-	2	1	-	-	-	-	-	-	-	50	20	-	-	50	20	50
		17	0	12	22														900
	Total Contact Hours	29																	

Professional Elective - III	
1ADPE315	Game Theory in AI
1ADPE316	Intelligent Precision Agriculture
1ADPE317	AI in Robotics
1ADPE318	Advanced Databases

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Sant Dnyaneshwar Shikshan Santha's

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Artificial Intelligence and Data Science Department

Academic Year: 2024-25 **Semester: Odd**

Open Elective-1 List of Courses

Sl.No	Course Code	Course Category	Course Name
1	1ILOE351	Health Care Management	Economics of Health and Education
2	1ILOE352	Business Marketing	Business to Business Marketing (B2B)
3	1ILOE353	Intellectual Property Rights	Patent Law for Engineers and Scientists
4	1ILOE354		Economics of Innovation
5	1ILOE355	Business Laws	E-Business
6	1ILOE356	Finance and Accounting	Management Accounting
7	1ILOE357	Banking and Insurance	Economics of Banking and Finance Markets
8	1ILOE358	Investment Management	Quantitative Investment Management
9	1ILOE359	Human Resource Management	Human Resource Development
10	1ILOE360	Business Management	Advanced Business Decision Support Systems
11	1ILOE361	Language	Introduction to Japanese Language and Culture - II
12	1ILOE362		German - I
13	1ILOE363	Retail and Channel Management	Operations and Supply Chain Management

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Course Details:

Class	TY B. Tech, Sem. V
Course Code &Course Title	**1ADPC301** Design and Analysis of Algorithms
Prerequisite/s	1ADPC202
Teaching Scheme (Lecture Practical/Tutorial)	3/0/2
Credits	04
Theory Evaluation Scheme: ISE/ MSE /ESE	40/30/30
Practical Evaluation Scheme: ISE/ESE	50/50

Course Outcomes (COs) : Upon successful completion of the course, the students will be able to:	
1ADPC301_1	**Understand** Algorithm Design Techniques and Analyze Algorithm Efficiency
1ADPC301_2	**Evaluate** solvability, insolvability, Correctness of a problem and computational models of parallel algorithm.
1ADPC301_3	**Solve** Searching ,traversing ,branch bound techniques ,NP
1ADPC301_4	**Apply** backtracking technique for efficient graph traversal.
1ADPC301_5	**Analyze** complexity of different algorithm designs.

Course Contents:		
Unit No.	**Unit Name**	**Contact Hours**
Unit 1	**Divide and Conquer Method** Introduction: Algorithm, Algorithm specification, performance analysis, Randomized Algorithms, Binary search, Finding the maximum and minimum, Merge sort, Quick sort, Selection sort	07 Hrs.
Unit 2	**The Greedy Method** The general method, Knapsack problem, Job sequencing, minimum-cost spanning trees – Prim's and Kruskal's Algorithms, Optimal storage on tapes, Graph coloring problem, Single source shortest path.	06 Hrs.
Unit 3	**Dynamic Programming** Introduction, Characteristics of dynamic programming, Shortest Path: Bellman ford, Reliability design, Traveling Sales person problem. , Multistage graphs, All pair shortest paths, Optimal binary search trees, 0/1 knapsack	06 Hrs.
Unit 4	**Basic Traversal and Search Techniques** Techniques for trees, Techniques for Graphs, Breadth first Search & Traversal ,Depth Frist Search & Traversal, AND/OR graphs, Connected components and Spanning Trees, Biconnected components and depth first search	07 Hrs.

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Unit 5	**Branch & Bound, Backtracking** Branch & Bound: Traveling Sales person problem,15 Puzzle problem Backtracking: 8-queen problem, sum of subsets, Hamiltonian Cycle, Graph Coloring	08 Hrs.
Unit 6	**NP and Parallel computation** Infeasibility: P and NP-classes, NP-hard problems Parallel Computational models: PRAM, MESH, HYPERCUBE - Fundamental Algorithms	05 Hrs.

Experiment List:	
1	Implement maximum and minimum using iterative version and divide & conquer method. Compare the time complexity of both.
2	Implement job sequencing using Greedy problem.
3	Implement graph coloring using Greedy Method.
4	Program based on minimum-cost spanning trees.
5	Program based on General method of Dynamic Programming.
6	Program based on Dynamic Programming.
7	Program based on general method of backtracking.
8	Program based on backtracking.
9	Program based on AND/OR graph.
10	Using Open MP, implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements.
11	Micro Projects: Work in Teams on Algorithmic Projects to solve real time problems

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fundamentals of Computer Algorithms	Ellis Horowitz, Satraj Sahani, Saguthevar Rajasejaran	University Press	2	2008
02	Introduction to Algorithms	Thomas Cormen, Charles Leiserson, Ronald RIvest, Clifford Stein	PHI	3	2009
03	Algorithms in a Nutshell	G. T. Heineman, G. Pollice, S. Selkow	O'Reilly	1	2008
04	Fundamentals oalgorithms	G. Brassard, P. Brately	Pearson Education	1	2015

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Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
01	The Design and Analysis of Algorithms	Aho, Hopfcraft and Ullman	Pearson Education	1	2000
02	Algorithms	Kenneth Berman, Jerome Paul	CENAGE Learning	1	2010

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Course Details:

Class	TY B. Tech., Sem. V
Course Code &Course Title	**1ADPC302 Data Exploration And Visualization**
Prerequisites	1ADVS206
Teaching Scheme (Lecture / Tutorial /Practical)	2/0/2
Credits	03
Evaluation Scheme Theory: ISE /MSE/ ESE	40/30/30
Evaluation Scheme Practical: ISE / ESE	50/50

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
1ADPC302_1	**Identify** the relationships between variables and Articulate the transformations
1ADPC302_2	**Analyze** the concept of single variable ,numerical summaries
1ADPC302_3	**Analyze** the concept of visualization, networks, graphs, maps
1ADPC302_4	**Correlate** data sets main characteristics, often using graphics and other data visualization methods.
1ADPC302_5	**Discover** the way to visually represent connections between entities in data, social data analysis.

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Exploratory Data Analysis** Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality - Smoothing Time Series	04 Hrs.
Unit 2	**Working With Two Variable And Three Variable** Relationships between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines – Transformations - Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data.	04 Hrs.

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Unit 3	**Introduction To Data Visualization** The Seven Stages of Visualizing Data - Getting Started with Processing - Mapping - Time Series - Connections and Correlations - Scatterplot Maps - Trees, Hierarchies, and Recursion ,Networks and Graphs ,Acquiring Data ,Parsing Data	05Hrs.
Unit 4	**Visualization Design And Tools** visual display of quantitative information, data-ink maximization, graphical design, exploratory data analysis, heat map, SVG , Visualization tools: Line plots, area plots, histogram, bar charts, pie charts, bubble plots, waffle charts, word clouds	04Hrs.
Unit 5	**Collaboration** Graph Visualization and Navigation, Online Social Networks, Social Data Analysis, Collaborative Visual Analytics, Text, Map, Geospatial data, 2-D Graphics, 3-D Graphics, Photorealism, Non-Photorealism, the human retina: Perceiving Two Dimensions	04Hrs.
Unit 6	**Techniques And Applications** Basic Data Exploration Techniques - Basic Data Visualization Techniques - Visualizing Geographic Data with gmap, United States - Case Study – Single Family Residential Home and Rental Values, Introduction of web crawling	05Hrs.

Experiment List:	
Expt. No.	**Title of Experiment**
1	Implement distribution of variables and Numerical Summaries of Level and Spread on iris dataset.
2	Perform scaling and standardizing operation on iris dataset
3	Implement Line plots, area plots, Histogram, bar charts, pie charts, bubble plots, waffle charts, word clouds on sample data points.
4	Examine how two variables relate to each other. This can involve identifying correlations, dependencies, or causal relationships.
5	Analysis of data points collected or recorded at specific time intervals with sample data points.
6	Identify and visualize relationships between variables on iris dataset.
7	Visualizing hierarchical data structures using various techniques like dendrograms, tree maps, and sunburst charts with sample data points.
8	Visualize textual data to reveal patterns, trends, and insights.
9	United States - Case Study: Single Family Residential Home and Rental Values

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10	Visualize geographic data to understand spatial relationships and patterns.
11	Implement Web crawling process of automatically navigating and extracting information from websites
12	Micro project

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Visualization Analysis and Design	Tamara Munzner	CRC Press	-	2014
2	Introduction to data visualization tools	Dr. S. Karpagavalli	Blue Hill publishers	-	2020
3	Beginner's Guide for Data Analysis using R Programming,	Jeeva Jose	Khanna Publishing	-	2019.

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Exploring Data: An Introduction to Data Analysis for Social Scientists	Catherine Marsh, Jane Elliott	Wiley Publications.	2nd Edition,	2008
2	Data Visualization Handbook	J. Koponen, J. Hildén	CRC Press	-	2019
3	The Book of Trees: Visualizing Branches of Knowledge	M. Lima, Princeton	Architectural Press	-	2014

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Course Details:

Class	TY B. Tech., Sem. VI
Course Code and Course Title	**1ADPC303 Machine Learning**
Prerequisite/s	1ADPC211
Teaching Scheme: Lecture/Tutorial/Practical	3/0/2
Credits	04
Evaluation Scheme: ISE/ MSE /ESE	40/30/30
Practical Evaluation Scheme: ISE	50

Course Outcomes (COs):
Upon successful completion of the course, the students will be able to:

1ADPC303_1	**Understand** the fundamental concepts of machine learning.
1ADPC303_2	**Implement** machine learning algorithms & libraries & Tools for various applications.
1ADPC303_3	**Analyze** and evaluate the performance of different types of machine learning models.
1ADPC303_4	**Explore** advanced topics and current trends in machine learning & study real time applications
1ADPC303_5	**Develop** skills to solve real-world problems using machine learning techniques& algorithms.

Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Introduction to Machine Learning** Overview of Machine Learning, why machine learning? Problems Machine Learning can solve, Types of Machine Learning: Supervised, Unsupervised, Semi-supervised, Reinforcement Learning, Python libraries & Tools- Jupyter Notebook, Colab , Numpy , Scipy ,mtplotlib ,pandas , Applications of Machine Learning	7 Hrs.
Unit 2	**Supervised Learning** Classification and Regression, Generalization, Overfitting, Under fitting Regression: Linear Regression, Logistic Regression, Ridge Regression, Bayesian Linear Regression Classification: -k-Nearest Neighbors, Decision Trees, Random Forest model, Support Vector Machines. Model evaluation techniques.	6 Hrs.

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Unit 3	**Unsupervised Learning** Types of Unsupervised learning, Challenges in Unsupervised learning, preprocessing & Scaling, different types of preprocessing, Dimensionality Reduction, Feature Extraction, Manifold Learning-PCA, NMF, t-SNF, Clustering-K-Means, Agglomerative Clustering	7 Hrs.
Unit 4	**Advanced Learning** Reinforcement Learning, Representation Learning, Basic Neural Networks, Ensemble Learning, Bootstrap Aggregation, Association Rule Learning- Apriori Algorithm, Model Evaluation and Optimization-Cross Validation, Grid Search and Random Search, Hyper parameter Tuning	7 Hrs.
Unit 5	**Recommendation System and Time series analysis** Topic modeling Popularity based recommender engines, Content based recommendation engines, Classification based recommendation engine, collaborative filtering Date and Time Handling, Correlation, Time Series Forecasting	6 Hrs.
Unit 6	**Study of Applications** Image Recognition, Speech Recognition, Email spam and Malware Filtering, Online fraud detection, Medical Diagnosis, Product recommendations, Current Trends and Future Directions- Transfer Learning, AutoML	6 Hrs.

Experiment List:	
Expt. No	**Title of Experiment**
1.	Data Preprocessing with Python - Load datasets, handle missing values, perform feature scaling.
2.	Implementing Linear Regression Build a linear regression model, evaluate performance.
3.	Classification with Logistic Regression and KNN Implement logistic regression and KNN, compare their performance
4.	Detecting Spam mails using Support vector machine
5.	Model Evaluation with Cross-Validation Implement cross-validation techniques to evaluate models.
6.	Dimensionality Reduction with PCA Perform PCA on a dataset and interpret the results.
7.	Implement Image Recognition using MLP
8.	Association Rule Mining with Apriori Generate association rules using the Apriori algorithm.
9.	Implement Recommender System for Movie Recommendations
10.	Hyperparameter Tuning Use grid search and random search for model optimization.
11.	Choose best machine learning algorithm to implement online fraud detection

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12.	Micro-project: students work in team on any socially relevant problem that needs a machine learning based solution, and evaluate the model performance

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Introduction to Machine Learning	Ethem Alpaydin	Prentice Hall of India	3rd Edition	2015
2	Master machine learning algorithms	Jawson Browleen	Machine learning Master2016	-	2016
3	Introduction to Machine Learning	Prentice Hall of India,	-	3rd Edition	2015
4	Machine Learning	Tom Mitchell	McGraw-Hill	-	2017

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Pattern Recognition and Machine Learning	Christopher M. Bishop	Springer Publications	-	2011
2	Artificial Intelligence: A Modem Approach	Stuart Jonathan Russell	Prentice Hall	3rd	2020
3	Machine Leaming Dummies	John Paul Muller, Luca Massaron	Wiley Publications	-	2021

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Course Details:

Class	TY B. Tech., Sem. V
Course Code and Course Title	1ADHS304- **Entrepreneurship**
Prerequisite/s	--
Teaching Scheme: Lecture/Tutorial/Practical	0/0/2
Credits	1
Evaluation Scheme: ISE –I/ISE-II	25/25

Course Outcomes (COs):	
1ADHS304_1	Identify and evaluate potential business opportunities in the engineering domain.
1ADHS304_2	Conduct market research and analyze the competitive landscape.
1ADHS304_3	Craft a comprehensive business plan, including financial projections.
1ADHS304_4	Understand the fundamentals of marketing, sales, and operations for engineering ventures.
1ADHS304_5	Pitch their business ideas to potential investors.
1ADHS304_6	Grasp the legal and ethical considerations of starting a business.

Course Contents:

1. The Entrepreneurial Ecosystem
2. Idea Identification and Prototyping
3. Testing, Validation and Commercialisation
4. Market Analysis and Competitive Landscape
5. Legal Procedure to setup an Startup Business
6. Understanding Finance Basics
7. Business Planning and Development
8. Marketing and Sustainability
9. Pitching and Fundraising
10. Startup Case Studies

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Reference Materials:

1. https://www.startupindia.gov.in/content/sih/en/international/go-to-market-guide/indian-startup-ecosystem.html
2. https://www.startupindia.gov.in/content/sih/en/learning-and-development_v2.html
3. https://onlinecourses.nptel.ac.in/noc24_mg93/preview

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Course Details:

Class	TY B. Tech., Sem. V
Course Code and Course Title	**1ADAI305 Minor Course 2: Python Programming**
Prerequisite/s	1ADPC105
Teaching Scheme: Lecture/Tutorial/Practical	3/0/0
Credits	03
Evaluation Scheme: ISE / MSE /ESE	40/30/30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADAI305_1	**Understand** basic programming concept in python
1ADAI305_2	**Implement** conditional & Looping statement in python
1ADAI305_3	**Apply** OOPs concepts in python programming
1ADAI305_4	**Illustrate** Functions, Tuples, Dictionaries and Sets in Python
1ADAI305_5	**Implement** File And Exception handling

Course Contents:

Unit No	Unit Name	Hours
Unit 1	**Introduction to Python:** Introduction of Python and history of Python, Features of Python, Installation of Python Environment Setup, Python Identifiers, Keywords and Indentation, Comments, Variables, Variable Names, Variables - Assign Multiple Values, Python - Output Variables, Global Variables, Data Types, Operators	7Hrs
Unit 2	**Control Statement & Strings** **Sequence Control** – Precedence of operators, Type conversion Conditional Statements: if, if-else, nested if-else, Looping- for, while, nested loops, loop control statements (break, continue, pass) a. **Strings:** declaration, manipulation, special operations, escape character, string formatting operator, Raw String, Unicode strings, Built-in String methods.	7Hrs
Unit 3	**Object Oriented Concept** Classes and objects declaration, Constructor, Inheritance: Single Inheritance, Multiple Inheritance, Multilevel Inheritance, Regular Expressions, Principles of Object Orientation, Iterators, Polymorphism, Encapsulation and abstraction, Operator Overloading	6Hrs
Unit 4	**Lists Tuples and Dictionaries** Python Lists: Concept, creating and accessing elements, updating &	

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	deleting lists, traversing a List, reverse Built-in List Operators, Concatenation, Repetition, In Operator, Tuples, Accessing values in Tuples, Tuple Assignment, and Tuples as return values, Variable-length argument tuples, and Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in tuple functions, indexing, slicing and matrices. Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys.	6Hrs
Unit 5	**Function In Python:** Built-in List functions and methods. Functions: Definitions and Uses, Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Flow of Execution, Parameters and Arguments, Variables and Parameters, Void Functions, Anonymous functions.	6Hrs.
Unit 6	**I/O and Error Handling In Python** Python File Open, Python Read File, File Write, Python Delete File, Writing Binary Files Manually, Using Pickle to Write Binary Files, What is Exception?, Handling an exception, try....except...else, try-finally clause, Argument of an Exception.	7Hrs

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Programming Python	Mark Lutz	O'Reilly	4th	-
2.	Python for Everybody: Exploring Data in Python	Charles R. Severance	Kindle Edition	3rd	-

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Core Python Programming	Wesley J.	Prentice	Hall PTR First Edition	-
2.	Exploring Python	T. Budd	TMH	1st	2011
3.	Programming Python	Mark Lutz	O'Reilly	4th	-

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Course Details:

Class	TY B.Tech., Sem. V
Course Code and Course Title	**1ADPE306 Professional Elective II Data science using R**
Prerequisite/s	1ADPC210
Teaching Scheme: Lecture/Tutorial/Practical	2/0/2
Credits	3
Practical Evaluation Scheme: ISE	50

Course Outcomes(COs):	
Upon successful completion of this course, the student will be able to:	
1ADPE306_1	**Understand** the basic concepts of data science and the R programming environment.
1ADPE306_2	**Apply** appropriate data structures for different types of data and its manipulation.
1ADPE306_3	**Apply** R programming fundamentals to solve problems and manage data.
1ADPE306_4	**Implement** import and export data using R.
1ADPE306_5	Manipulate data and **create** visualizations using R.
1ADPE306_6	**Develop** and evaluate linear models using R.

Course Contents:

Unit No.	Unit Name	Hours
Unit 1	**Introduction to Data Science and R** Definition and importance of data science, Overview of the data science process (data collection, preparation, analysis, modeling, evaluation, and deployment), Installation and setup of R and RStudio, Basic operations in R	04 Hrs.
Unit 2	**Data Types and Structures in R** Data Types-Numeric, character, factor, and logical data types, Type conversion, Data Structures-Vectors, Matrices, Lists, Data frames	05 Hrs.
Unit 3	**R programming fundamentals** Conditions and loops, Functions in R, Objects and Classes, Debugging, String operations in R, Regular Expressions, Dates in R	04 Hrs
Unit 4	**Data Import and Export in R** Reading CSV and Excel files, Reading data from databases (SQL), Writing Data-Exporting data to CSV, Excel, and other formats, Saving R objects (RDS files)	04 Hrs.

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Unit5	**Data Manipulation and Visualization** **Data Manipulation**-List Management, Data Transformation, Merging Data Frames, Outlier Detection, Combining multiple vectors **Data Visualization**- Creating bar chart and dot plot, Creating histogram and box plot, Plotting with base graphics, Plotting and coloring in R	05 Hrs.
Unit 6	**Linear Models Using R** Linear Models, Simple Linear Regression and Multiple Regression, Generalized Linear Models, Nonlinear Models, Splines- Decision-Random Forests.	04 Hrs.

Experiment List:

Exp No	Experiment Name
1	Installing R and R studio, Create a folder DS_R and make it a working directory, installing the "ggplot2","caTools","CART" packages.
2	Learn all the basics of R-Programming (Data types, Variables Operators etc.)
3	Implement R-Loops with different examples.
4	Learn the basic of functions in R and implement with examples.
5	Create a data set and do statistical analysis on the data using R.
6	Write a R Program to Convert a given matrix into 1 dimensional array, Create an 3 dimensional array of 24 elements using the dim () function.
7	Write an R Program to create a vector, add two vectors of integer type, and find sum, mean and product of a vector.
8	Implementation of Data frame and its corresponding operators and functions
9	Write an R Program to read data from the file and writing output back to specified file.
10	Create bar charts, line, scatter plots, histogram using R.
11	Implementation of the linear and multiple linear regression using R.
12	Micro-project: students work in team on any socially relevant problem that needs a Data science using R based solution, and evaluate the model performance

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	R programming for data science	Roger D Peng	Leanpub	-	2014
2	Beginning R- The Statistical Programming Language	Mark Gardener	Wiley & Sons,I c	-	2012

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Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1	Beginning R-The Statistical Programming Language	Mark Gardener	John Wiley &Sons, Inc	-	2012
2	Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics	Nathan Yau	Wiley	-	2011
3	The Book of R	Tilman M. Davies	Nostar chpress	-	2015

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Course Details:

Class	TY B. Tech., Sem. V
Course Code and Course Title	1ADPE307- **Professional Elective II: Software Engineering & Testing**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	2/0/2
Credits	03
Theory Evaluation Scheme: ISE /MSE/ESE	-
Practical Evaluation Scheme: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADPE307_1	**Understand** the principles of Software Engineering and process models for developing a software project
1ADPE307_2	**Apply** various methods of capturing, specifying, visualizing, and analyzing software requirements
1ADPE307_3	**Apply** Design and Testing principles to S/W project development
1ADPE307_4	**Design** UML diagrams, plan, and schedule project
1ADPE307_5	**Estimate** Project Metrics and **use** Software Configuration management

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Introduction to Software Engineering, Software Process Models** Nature of Software, Software Engineering Principles, The Software Process, Software Myths. Process Models: A Generic Process Model, Prescriptive Process Models: The Waterfall, Incremental Process(RAD), Evolutionary Process, Unified Process, Concurrent. Advanced Process Models & Tools: Agile software development: Agile methods, Plan-driven and agile development	04Hrs.
Unit 2	**Software Requirements Engineering & Analysis** Requirements Engineering: User and system requirements, Functional and non-functional requirements, Types & Metrics, A spiral view of the requirements engineering process. Software Requirements Specification (SRS): The software requirements Specification document, The structure of SRS, structured & tabular SRS.	04 Hrs.

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Unit 3	**Design Engineering** Design Process & quality, Design Concepts, The design Model, Pattern-based Software Design. Architectural Design: Design Decisions, Views, Patterns, Application Architectures, Modeling Component level Design: component, Designing class-based components, conducting component-level design, User Interface Design: The golden rules	05 Hrs.
Unit 4	**Project Estimation** Project Estimation: Observations on Estimation, Project Planning Process, Software Scope and feasibility, Resources: Human Resources, Reusable software, Environmental Resources. Software Project Estimation, Decomposition Techniques, Empirical Estimation Models: Structure, COCOMO Model	04 Hrs.
Unit 5	**Software Configuration** The SCM repository, SCM process, Configuration management for Web Apps, Case study: CVS and Subversion Tools, Visual Source Safe from Microsoft & Clear Case. Maintenance & Reengineering: Software Maintenance, Software Supportability, Reengineering, Business Process Reengineering, Software Reengineering,	05 Hrs.
Unit 6	**Software Testing** Introduction to Software Testing, Principles of Testing, Testing Life Cycle, Phases of Testing, Types of Testing, Verification & Validation, Defect Management, Defect Life Cycle, Bug Reporting, GUI Testing, Test Management and Automation.	04 Hrs.

Experiment List:

Exp No	Title of Experiment
1	Identify the Requirements from Problem Statements
2	To prepare the Software Requirement sheet for the problem statement
3	Identify entity sets, their attributes, and various relationships and represent the data model through ER diagram
4	To estimate Project Metrics for the examination management system
5	To Design UML Use Case Diagrams and Capturing Use Case Scenarios
6	To generate the UML diagram for the library management system
7	To generate the UML diagram for the course reservation system
8	To generate Gnatt/ PERT Chart for the development plan
9	To develop a set of test cases that will completely test the program in languages like C/ C++/ Python
10	To estimate Test Coverage Metrics and Structural Complexity
11	To design Test Suite
12	Micro project: Prepare a report using all Software engineering and testing concept

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Text Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
01	Software Engineering: A Practitioner's Approach	Roger Pressman,	McGraw Hill, ISBN 0–07–337597–7	7th	2010
02	Software Engineering	Ian Sommerville	Addison and Wesley, ISBN 0-13-703515-2	9th	2010

Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1	Fundamentals of Software Engineering	Carlo Ghezzi,	Prentice Hall India, ISBN-10: 0133056996	2nd	2002
2	Fundamentals of Software Engineering	Rajib Mall	Prentice Hall India, ISBN-13: 978-8120348981	4th	2014

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Course Details:

Class	TY B.Tech., Sem.V
Course Code and Course Title	**1ADPE308** **IoT Embedded System for AI**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	2/0/2
Credits	02
Evaluation Scheme: ISE	50

Course Outcomes(COs): Upon successful completion of this course, the student will be able to:	
1ADPE308_1	**Understand** the fundamentals of IoT and embedded systems
1ADPE308_2	**Design** and implement IoT solutions for data collection and communication
1ADPE308_3	**Apply** machine learning algorithms to analyze IoT data and derive insights
1ADPE308_4	**Demonstrate** practical skills in prototyping and testing IoT applications.
1ADPE308_5	**Analyze** ethical and societal implications of AI-powered IoT systems.

Course Contents:

Unit No.	Unit Name	Hours
Unit 1	**Introduction to IoT and Embedded Systems** Overview of IoT (Internet of Things) and its applications, Basics of embedded systems and their role in IoT, Hardware components and architectures of embedded system IoT Enabling Technologies	04 Hrs.
Unit 2	**IoT Communication Protocols** Communication stack for IoT ,Machine to machine communication(M2M),Introduction to various protocols such as Message Queue Telemetry Transport (MQTT), Constrained Application Protocol (CoAP), 6LoWPAN	05 Hrs.
Unit 3	**Embedded System Programming** Introduction to microcontrollers (e.g. Arduino, Raspberry Pi) , Interfacing of sensors to Arduino or Raspberry Pi, Wi-Fi and Bluetooth-enabled microcontrollers	04 Hrs.

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Unit 4	**Embedded Software Development** Real time operating systems, Kernel architecture: hardware, task/process control subsystem, device drivers, system calls, programming languages :assembly languages, high level language.	05 Hrs.
Unit 5	**IoT Data generation and storage** Introduction to Cloud Storage models and communication APIs Web server for IoT, Cloud for IoT, RESTful web API	04 Hrs.
Unit 6	**Applications of IoT, case studies** Home Automation, smart cities, Environment, Agriculture, Productivity Application	04 Hrs.

Experiment List:

Exp No	Title of Experiment
1	To interface LED to Arduino Uno or Raspberry Pi
2	To interface LCD to Arduino Uno or Raspberry Pi
3	To interface temperature sensor to Arduino Uno or Raspberry Pi and display temperature on LCD
4	To interface Wi Fi module to Arduino Uno or Raspberry Pi
5	To interface PIR (Passive Infrared) sensor with an Arduino or Raspberry Pi to detect motion.
6	To create a Things Speak account for uploading the sensors data.
7	To control devices connected to Arduino Uno by Application created using Remote XY
8	To remotely control an actuator (e.g., LED, motor) connected to an ESP8266 device using a cloud-based MQTT broker.
9	To set up an MQTT-based communication system between a client (ESP8266) and a broker (Mosquitto) for sending and receiving messages.
10	To design any IoT application using Arduino/Raspberry Pi /open platform

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Text Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1.	Internet of Things	Jeeva Jose	Khanna Book Publishing Company	-	2021
2.	The Internet of Things	Samuel Green Gard	MIT Press	1st	2015

Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1	Mastering Internet of Things: Design and Create your own IoT Applications using RaspberryPi3	Peter Waher	Packt Publishing Ltd	1st	2018

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Course Details:

Class	TY B. Tech., Sem. V
Course Code and Course Title	1ADPE309- **Professional Elective II: Data Annotations**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	2/0/2
Credits	03
Practical Evaluation Scheme: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADPE309_1	**Understand** concepts of data annotation, Benefits of data annotation, and Applications of data annotations in machine learning
1ADPE309_2	**Elaborate on** the concepts of data labeling, data labeling approaches, and the working of data labeling
1ADPE309_3	**Illustrate** Text annotation, image annotation, video annotation, audio, and key point annotation in real-world examples
1ADPE309_4	**Summarize the** use of annotation in real-world applications

Course Contents:

Unit No.	Unit Name	Hours
Unit 1	**Introduction to data annotation** Introduction to annotation, Manual vs. Automated Data Annotation, Benefits of data annotation, Principles of Data Annotation, Types of data annotation Applications of data annotations in machine learning, Data annotation tools -brat rapid annotation tool, Web-based annotation tool , Data storage structure, Data annotation quality	05 Hrs.
Unit 2	**Data annotation** Introduction to data labeling for image classification, unlabeled data vs label data, Human-in- the-Loop(HITL),data labeling approaches, common types of data labeling, data annotation with Computer vision annotation tools , Data labeling for object detection, Introduction to key point annotation	04 Hrs.
Unit 3	**Text annotation** Basics of Text Annotation, Types of Text Annotation ,Working of text annotation, use cases of text annotation, uses of text annotation, NLP text annotation, Text labeling for sentiment analysis, Labeling text data, Multilingual Support, Propagate regex from UI	04 Hrs.

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Unit 4	**Image annotation** Basics of image annotation, need of image annotation, types of image annotation, image classification , object detection, Semantic Segmentation, Instance segmentation, image annotation techniques, image annotation use cases, Key point Annotation, Polygon Annotation, Bounding Box Annotation	04 Hrs.
Unit 5	**Video annotation** Introduction to video annotation, purpose of video annotation in machine learning, how video annotation works, types of video annotation, video annotation for machine learning, Challenges and critical considerations in video annotation, AI video annotation, Video annotation tools and platform, Video annotation for medical imagery, Skeletal annotation	05 Hrs.
Unit 6	**Audio Annotation** Introduction to audio annotation, Importance of audio annotation, Different types of audio annotation , Tools and Techniques for Audio Annotation - Praat, Audacity, ELAN, Techniques for Accurate Annotation, Multi-level Annotations	04 Hrs.

Experiment List:	
Exp. No	**Title of Experiment**
1	To Perform the Data Annotation & Audio Annotation for existing data.
2	To perform Semantic Segmentation & Image Annotation
3	To perform object detection and Segmentation of Instance
4	To Perform Image Annotation for Bounding Boxes, Polygonal Segmentation
5	To Perform Image Annotation to Perform 3D Image data representation
6	To perform the Data Attributes operations using data annotation
7	To Perform the Versatility for Set of Text, Image, Audio, Video
8	To Perform the Open Source Data Annotation & Labeling Tools
9	To Perform Multi Model & Multi Domain Text Annotation Tools
10	To Perform Image Annotation Tools 3D Slicer, CATMAID, COCO Annotator

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Text Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
01	NaturalLanguage Annotation for Machine Learning: A Guide to Corpus-Building for Applications	James Pustejovsky, Amber Stubbs	O'Reilly Media	1st	2012
02	Provenance and Annotation of Data and Processes	Luc Moreau , Juliana Freire, David Koop	Springer		2008

Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1	Image Processing and Analysis: Variational, PDE, Wavelet, and Stochastic Methods	Chan Tony F, Shen Jianhong	Bio Medical Engineering On Line	1st	2006
2	Video Data Management and Information Retrieval	Sagarmay Deb	IGI Global	1st	2005

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Course Details:

Class	TY B. Tech., Sem. V
Course Code and Course Title	**1ADEL310** Inplant Training/Internship
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	0/0/0
Credits	01
Practical Evaluation Scheme: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADEL310_1	**Explain** the knowledge acquired in a given field during industrial training
1ADEL310_2	**Understand** the knowledge level skills ,attribute for the students
1ADEL310_3	**Demonstrate** competency in relevant engineering fields through case study
1ADEL310_4	**Apply** the fundamental knowledge of engineering to given industrial problems/task using appropriate techniques, resources and modern engineering tools
1ADEL310_5	**Ccommunicate** eeffectively, both orally and in writing report related to given field showing engineering & management principles.

The students Undergone for 15 Days Internship under Curriculum credits
Project Load
Maximum 10 students allocated for One Faculty 6:4 ratio
Mode of Assessment
This subject content of the internship emerging with thrust areas, the completion of work and the submission of report and assessment should be done at the end of part-I

Course Contents:
Industrial Training Requirement:
Duration: Minimum two weeks during the semester break after the fourth semester.
Completion: Within 15 calendar days before the start of the fifth semester.
Industry Preference: Students should seek internships in industries related to mechanical engineering to ensure the experience is relevant and beneficial
The report should demonstrate practical application of course-related knowledge and skills.

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After completion of training, each student has to submit following documents to training in charge:

Industry Evaluation Rubric filled by industry

Report of the training (Minimum 25 pages contents of the report with Case Study)

Completion original Certificate of Training by Industry.

Photocopy of Institute application letter to industry.

GPS Images and Photos: Each student must give a hard copy of the Internship Glimpse This template consists of two pages dedicated to showcasing the highlights of your internship through photographs, ensure that the template is separate from the internship report document

Attendance Sheet

Report Submission Guidelines

As part of the internship program, students are required to submit a detailed report documenting their experiences and learnings during the internship.

The following guidelines outline the requirements for the report submission:

Content Requirements:

The report should include an introduction that provides an overview of the internship, including the company name, duration, and objectives.

Students should describe the tasks and projects they were involved in, detailing the specific roles and responsibilities they undertook.

The report should highlight key observations and insights gained from the internship, focusing on industry practices, technologies, and methodologies encountered.

Students are encouraged to analyze and discuss any challenges faced during the internship and how they were addressed or overcome.

The conclusion should summarize the overall experience, emphasizing the practical skills and knowledge acquired, and reflecting on how the internship has contributed to their professional development.

Formatting and Structure:

The report should be well organized, clearly written, and free of grammatical errors.

It should include a title page, table of contents, and properly formatted sections and subsections.

Any diagrams, charts, or photographs included should be relevant and appropriately labeled.

Evaluation Process:

Individual student must undergo presentation of training content before the evaluation committee constituted by the department. An internal evaluation will be conducted for examining the quality and authenticity of contents of the report. Marks will be awarded after the end of the presentation and submission of report

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Course Details:

Class	TY B. Tech., Sem. V
Course Code and Course Title	**1ADCC311 Aptitude and Reasoning Part-III**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	0/0/2
Credits	01
Evaluation Scheme: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADCC311_1	Solve problem based on basic and advance Permutation and Combination
1ADCC311_2	Solve problem based on Probability, Application of Probability, Cubes, Dices, cube painting and Syllogism
1ADCC311_3	Solve problem based on Mensuration 3D, Circle & Triangle
1ADCC311_4	Demonstrate on Resume writing skill, closed, advanced grammar, Synonyms and Antonyms
1ADCC311_5	

Course Contents:

Unit No.	Unit Name	Hours
Unit 1	• Basic Permutation and Combination • Advance Permutation and Combination	4 hours
Unit 2	• Probability • Application of Probability	4 Hours
Unit 3	• Cubes, Dices & cube painting • Syllogism	4 Hours
Unit 4	• Mensuration 3D • Circle & Triangle	4 hours
Unit 5	• Resume writing & resume making • Interview Techniques	4 Hours
Unit 6	• Closed Test & advanced Grammar • Synonyms & Antonyms	4 Hours

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Quantitative Aptitude for Competitive Examinations	R.S. Agarwal	S Chand		2022
02	Verbal and Non-verbal Reasoning	R.S. Agarwal	S Chand		2010
03	Verbal, Grammar	P.C.Wren	S Chand		2017

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Curriculum Structure

T.Y B.Tech. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SEM V & SEM VI

(Academic Year 2024- 2025)

Artificial Intelligence and Data Science Department

Teaching and Evaluation Scheme

T. Y. B. Tech Semester V *^

Course Code	Course Name	Teaching Scheme				THEORY							PRACTICAL						GRAND TOTAL
						ISE		MSE + ESE			Total	Min	ISE		ESE		Total	Min	
		L	T	P	Credits	Max	Min	MSE	ESE	Min			Max	Min	Max	Min			
1ILOE3**	Open Elective - I	3	-	-	3	50	20	-	-	-	50	20	-	-	-	-	-	-	50
1ADPC301	Design and Analysis of Algorithms	3	-	2	4	40	16	30	30	24	100	40	50	20	50	20	100	40	200
1ADPC302	Data Exploration and Visualization	2	-	2	3	40	16	30	30	24	100	40	50	20	50	20	100	40	200
1ADPC303	Machine Learning	3	-	2	4	40	16	30	30	24	100	40	50	20	-	-	50	20	150
1ADHS304	Entrepreneurship	-	-	2	1	50	20	-	-	-	50	20	-	-	-	-	-	-	50
1ADAI305	Minor Course - 2 ^ Python Programming	3	-	-	3	40	16	30	30	24	100	40	-	-	-	-	-	-	100
1ADPE3**	Professional Elective - II	2	-	2	3	-	-	-	-	-	-	-	50	20	-	-	50	20	50
1ADEL310	Inplant Training / Internship	-	-	-	1	-	-	-	-	-	-	-	50	20	-	-	50	20	50
1ADCC311	Aptitude and Reasoning Part - III	-	-	2	1	-	-	-	-	-	-	-	50	20	-	-	50	20	50
		16	0	12	23														900
	Total Contact Hours	28																	

* Industrial Inplant Training / Internship Assesment should to be carried out during this semeser

^ Minor courses project work continuously assessed from Semester V. The final submission will at VIII semester

Professional Elective - II	
1ADPE306	Data science using R
1ADPE307	Software Engineering & Testing
1ADPE308	IoT Embedded systems for AI
1ADPE309	Data Annotations

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Annasaheb Dange College of Engineering and Technology

Artificial Intelligence and Data Science Department

Teaching and Evaluation Scheme

T. Y. B. Tech Semester VI

Course Code	Course Name	Teaching Scheme				THEORY							PRACTICAL						GRAND TOTAL
						ISE		MSE + ESE			Total	Min	ISE		ESE		Total	Min	
		L	T	P	Credits	Max	Min	MSE	ESE	Min			Max	Min	Max	Min			
1ILOE3**	Open Elective - II	3	-	-	3	50	20	-	-	-	50	20	-	-	-	-	-	-	50
1ADPC312	Computer Vision	3	-	2	4	40	16	30	30	24	100	40	50	20	50	20	100	40	200
1ADVS313	Cloud Computing	2	-	2	3	40	16	30	30	24	100	40	50	20	50	20	100	40	200
1ADPC314	Deep Learning	3	-	2	3	40	16	30	30	24	100	40	50	20	-	-	50	20	150
1ADPE3**	Professional Elective - III	3	-	-	3	40	16	30	30	24	100	40	-	-	-	-	-	-	100
1ADAI319	Minor Course - 3 ^ Information Retrieval	3	-	-	3	40	16	30	30	24	100	40	-	-	-	-	-	-	100
1ADEL320	Mini Project	-	-	4	2	-	-	-	-	-	-	-	50	20	-	-	50	20	50
1ADCC321	Aptitude and Reasoning Part - IV	-	-	2	1	-	-	-	-	-	-	-	50	20	-	-	50	20	50
		17	0	12	22														900
	Total Contact Hours	29																	

Professional Elective - III	
1ADPE315	Game Theory in AI
1ADPE316	Intelligent Precision Agriculture
1ADPE317	AI in Robotics
1ADPE318	Advanced Databases

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Course Details:

Class	TY B. Tech., Sem. VI
Course Code and Course Title	**1ADPC312 Computer Vision**
Prerequisite/s	1ADPC303
Teaching Scheme: Lecture/Tutorial /Practical	3/0/2
Total Contact Hours:	39
Credits	04
Evaluation Scheme: ISE/ MSE /ESE	40/30/30
Practical Evaluation Scheme: ISE/ESE	50/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADPC312_1	**Understand** fundamental concepts and techniques in computer vision
1ADPC312_2	**Implement** image processing algorithms for various applications
1ADPC312_3	**Apply** feature extraction methods for object detection and recognition
1ADPC312_4	**Analyze** the performance of computer vision system
1ADPC312_5	**Design** deep learning models for image classification and object detection tasks.

Course Contents

Unit No.	Unit Name	Hours
Unit 1	**Color Image Processing** Color Fundamentals, Color models, Color Transformations, Smoothing and Sharpening, Color Segmentation	06 Hrs.
Unit 2	**Texture Analysis** Definition, Types of texture, Texels, Texture analysis, Approaches to texture analysis, Statistics, Texture descriptors - statistical - Auto-correlation, co-occurrence matrices and features, local binary partition.	07 Hrs.

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Unit 3	**Representation & Description** Representation, Boundary Descriptors, Regional Descriptors, Use of Principal components for description, Relational Descriptors	06 Hrs.
Unit 4	**Object Recognition & Restoration** Object Recognition: Object Detection Vs recognition, Patterns and Pattern Classes, Statistical Pattern Recognition, Syntactic Pattern Recognition, Optimization Techniques in Recognition. Restoration: Image Restoration Model, Noise Models	07 Hrs.
Unit 5	**Moving Object Detection and Tracking** Introduction, Background Modeling, Connected Component Labeling, Shadow Detection, Discrete Kalman Filtering, Mean-shift tracking, Segmentation tracking via graph cuts.	07 Hrs.
Unit 6	**3D Vision and applications** Introduction to 3D imaging,3D Face recognition, 3D shape analysis, 3D medical applications, 3D robotics	06 Hrs.

Experiment List:

Expt. No.	Title of Experiment
1.	To Implement various basic image processing operations in python/matlab/open-CV: Reading images, writing images, conversion of images, and complementing of an image
2.	To perform Histogram Equalization
3.	To perform Image Filtering (Smoothing, Sharpening)
4.	To perform Edge Detection (e.g., Canny Edge Detector)
5.	To perform image Rotation, Translation, Scaling
6.	To perform Image Segmentation using Thresholding Techniques
7	To perform Image Feature Descriptor Matching
8	To perform Convolution Neural Networks (CNNs) for Object Detection
9	To Build a system that can extract text from images or documents and convert it into editable text.
10	To perform Deep Learning-based Classification e.g., CNNs

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Text Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1	Digital Image Processing	Gonzalez R. C., Woods R. E	PHI, Second Edition	2nd	2002
2	Digital Image Processing	Sonka Milan, Vaclav Hlavac,	Cengage Learning	3rd	2013

Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1	Digital Image Processing	S. Jayaraman, S.Esakkiraj, T. Veerkumr	Tata McGraw Hill	-	2010
2	Computer Vision – A Modern approach	D. A. Forsyth, J. Ponce,	Pearson Education, Prentice Hall,		2005
3	Computer Vision	Linda Shapiro, George C. Stockman	Prentice Hall	-	2000

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Course Details:

Class	TY B. Tech., Sem. VI
Course Code and Course Title	1ADVS313 **Cloud computing**
Prerequisite/s	1ADPC210, 1ADPC113
Teaching Scheme: Lecture/Tutorial /Practical	2/0/2
Credits	03
Evaluation Scheme: ISE / MSE /ESE	40/30/30
Practical Evaluation Scheme: ISE /ESE	50/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADVS313_1	**Interpret** the basic concepts of Cloud Computing and there evaluation.
1ADVS313_2	**Determine** the service oriented architecture. Identify the virtualization, Virtualization flexibility in disaster recovery.
1ADVS313_3	**Examine** the architecture of compute and storage cloud, service and delivery models.
1ADVS313_4	**Analyze** the concepts of inter cloud, Identify the cloud Security challenges.
1ADVS313_5	**Apply** the Hadoop and Map Reduce, identify the levels of federation, services, future of federation
1ADVS313_6	**Evaluate** Virtualization System in Cloud security.

Course Contents		
Unit No.	**Unit Name**	**Hours**
Unit 1	**Introduction** Introduction to Cloud Computing, Evolution of Cloud Computing, Flynn taxonomy, Characteristics of Cloud Computing , Advantages and Disadvantages and Application of Cloud Computing	04 Hrs.
Unit 2	**Cloud Enabling Technologies** Service Oriented Architecture ,Web Services ,Basics of Virtualization ,Types of Virtualization, Implementation Levels of Virtualization, Virtualization of CPU – Memory – I/O Devices ,Virtualization Support and Disaster Recovery.	05 Hrs.
Unit 3	**Cloud Architecture, Services and Storage** Layered Cloud Architecture Design, NIST Cloud Computing Reference Architecture, Cloud Deployment Models, Cloud Service Models, Cloud Storage, Cloud Storage Providers.	04 Hrs.

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Unit- 4	**Resource Management and Security in Cloud** Inter Cloud Resource Management , Resource Provisioning and Resource Provisioning Methods ,Global Exchange of Cloud Resources , Federation in the Cloud, Security Overview and its Challenges , Security Standards	06 Hrs.
Unit- 5	**Cloud Technologies and Advancements** Hadoop-HDFS, MapReduce, Overview of Virtual Box, Google App Engine-Overview, architecture, OpenStack, Federation in the Cloud-Overview, types of federation in cloud	04 Hrs.
Unit-6	**Cloud Security** Virtualization System Specific Attacks: Guest hopping, VM migration attack, hyper jacking, Data Security and Storage, Identity and Access Management (IAM) - IAM Architecture and Practice, IAM Challenges.	03 Hrs

Experiment List:

Expt. No.	Title of Experiment
1	Introduction to cloud computing.
2	Install Virtual box /VMware Workstation with different flavors of Linux or windows OS on top of windows7 or 8.
3	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
4	Install Google App Engine. Create hello world app and other simple web applications using python/java.
5	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6	Find a procedure to transfer the files from virtual machine to Host machine
7	Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8	Install Hadoop single node cluster and run simple applications like word count.
9	Case Study: PAAS(Facebook, Google App Engine)
10	Case Study: Student can undertake any one case study on public or private cloud

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Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Cloud Computing	Dr.Anup W. Ingle, Kalpana A. Kumbhar, Dr.Aparna B. Barbadekar,Nitin N. Sakhare	Nirali Publication	1st	2022
2	Cloud Computing: Implementation, Management and Security	John W James F. Ransome	CRC Press	3rd	2017

Reference Books:

Sr. No	Title	Author	Publisher	Editi on	Year of Edition
1	Mastering Cloud Computing	Buyya, Vecchiol a and Selvi	McGraw Hill Education	2nd	2017
2	Cloud Computing: A Practical Approach", McGraw Hill Education	Toy Velte, Antony Velte	Tata Mcgraw Hill	2nd	2009

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Course Details:

Class	TY B. Tech., Sem. VI
Course Code and Course Title	1ADPC314 **Deep Learning**
Prerequisite/s	1ADPC303
Teaching Scheme: Lecture/Tutorial/Practical	3/0/2
Credits	03
Evaluation Scheme Theory: ISE/ MSE /ESE	40/30/30
Evaluation Scheme Practical: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADPC314_1	**Describe** the fundamentals of neural networks
1ADPC314_2	**Apply** feed forward networks with back propagation
1ADPC314_3	**Analyze** the correct parameters and hyper-parameters of developed model for getting improved performance
1ADPC314_4	**Develop** different deep learning models for given tasks
1ADPC314_5	**Build** real-world applications using deep learning mechanisms and demonstrate effectively with verbal and written skills

Course Contents		
Unit No.	**Unit Name**	**Hours**
Unit 1	**Introduction to neural networks** - Neural Networks Basics - Functions in Neural networks – Activation function, Loss function - Function approximation - Classification and Clustering problems - Deep networks basics - Shallow neural networks – Activation Functions – Gradient Descent – Back Propagation	6 Hrs
Unit 2	**Deep Neural Networks(DNNs)** Introduction to Neural Networks :The Biological Neuron, The Perceptron, Multilayer Feed-Forward Networks , Training Neural Networks :Backpropagation and Forward propagation Activation Functions :Linear ,Sigmoid, Tannh, Hard Tanh, Softmax, Rectified Linear, Loss Functions :Loss Function Notation , Loss Functions for Regression , Loss Functions for Classification, Loss Functions for Reconstruction, Hyperparameters: Learning Rate, Regularization, Momentum, Sparsity.	7 Hrs
Unit 3	**Convolution Neural Network(CNN)** Introduction, CNN architecture overview, The Basic Structure of a Convolutional Network- Padding, Strides, Typical Settings, the ReLU layer, Pooling, Fully Connected Layers, The Interleaving between Layers, Local	7 Hrs

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	Response Normalization, Training a Convolutional Network	
Unit 4	**Recurrent networks-** Recurrent Neural Networks - Bidirectional RNNs, Encoder, Decoder, Sequence-to-Sequence Architectures, Deep Recurrent Networks, Auto encoders - Bidirectional Encoder Representations from Transformers (BERT).	6 Hrs
Unit 5	**Deep Generative Models** Introduction to deep generative model, Boltzmann Machine, Deep Belief Networks, Generative adversarial network (GAN), discriminator network, generator network, types of GAN, Applications of GAN networks	6 Hrs
Unit 6	**Reinforcement Learning** Introduction of deep reinforcement learning, Markov Decision Process, basic framework of reinforcement learning, challenges of reinforcement learning, Dynamic programming algorithms for reinforcement learning,Q Learning and Deep Q-Networks, Deep Q recurrent networks, Simple reinforcement learning for Tic-Tac-Toe.	7 Hrs

Experiment List:

List of Experiments	
Expt. No.	**Title of Experiment**
1	Designing and developing model for Autoencoder for Dimensionality reduction
2	Implement character and Digit Recognition using ANN.
3	Implement the analysis of X-ray image using autoencoders
4	Implement Speech Recognition using NLP ,For Home automation
5	Develop a code to design object detection and classification for traffic analysis using CNN
6	Designing and developing model for Text generation using LSTM
7	Implement image augmentation using deep RBM.
8	Designing and developing model for Autoencoder for classification
9	Micro Project: Number plate recognition of traffic video analysis.

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Text Books:					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Deep Learning	Goodfellow, I., Bengio, Y. Courville	MIT Press	2nd	2016
2.	Neural Networks and deep learning	Charu C. Aggarwal	Springer International Publishing	1st	2018

Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1.	Fundamentals of Deep Learning	Nikhil Buduma	O'Reilly	1st	2017
2.	Deep Learning: A Practitioner's Approach	Josh Patterson & Adam Gibson	O'Reilly (Greyscale Indian Edition)	1st	2016
3.	Deep Learning with Python	Francois chollet	Manning	1st	2017

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Course Details:

Class	TY B. Tech., Sem. VI
Course Code and Course Title	1ADPE315 **Professional Elective III: Game Theory in AI**
Prerequisite/s	1ADPC204
Teaching Scheme: Lecture/Tutorial /Practical	3/0/0
Credits	03
Evaluation Scheme: ISE / MSE /ESE	40/30/30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADPE315_1	**Understand** the basics of Game theory to provide insights.
1ADPE315_2	**Apply** the basic concepts for Games with Perfect & Imperfect Information
1ADPE315_3	**Analyze** the various Platform and Games application
1ADPE315_4	**Analyze** the concept of Games, Machine Design and Solutions appropriation tools
1ADPE315_5	**Evaluating** the Theoretical Knowledge of Non-Cooperative Game Theory

Course Contents		
Unit No.	**Unit Name**	**Hours**
Unit 1	**Introduction** Introduction Making rational choices: basics of Games strategy preferences payoffs Mathematical basics Game theory Rational Choice Basic solution concepts-non-cooperative versus cooperative games Basic computational issues finding equilibrium and learning in games- Typical application areas for game theory (e.g. Google's sponsored search, eBay auctions, electricity trading markets)	07 Hrs.
Unit 2	**Games with Impact Information** Games with perfect Information- Bayesian Games Motivational Examples- General Definitions- Information aspects Illustrations- Extensive Games with Imperfect Information Strategies- Nash Equilibrium Repeated Games- the Prisoner's Dilemma Bargaining- Games with Perfect Information — Strategicgames — prisoner's dilemma, matching pennies - Nash equilibria —mixed strategy equilibrium — zero-sum games	06 Hrs.
Unit 3	**Games With Imperfect Information** Games with Imperfect Information- Bayesian Games -Motivational Examples- General Definitions - Information aspects - Illustrations - Extensive Games with Imperfect - Information - Strategies -Nash Equilibrium -Repeated Games -The Prisoner's Dilemma- Bargaining.	07 Hrs.

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Unit 4	**Mechanism Design** Aggregating Preferences Social Choice Formal Model -Voting Existence of social functions –Ranking systems Protocols for Strategic Agents: Mechanism Design Mechanism design with unrestricted preference.	06 Hrs.
Unit 5	**Non-Cooperative Game Theory** Self-interested agents - Games in normal Form-Analyzing games: from optimality to equilibrium - Computing Solution Concepts of Normal - Form Games- Computing Nash equilibria of two-player, zero-sum games -Computing Nash equilibria of two players, general- sum games - Identifying dominated strategies	07 Hrs.
Unit 6	**AI Game Playing and CSP** Game theory – optimal decisions in games – alpha-beta search – monte-carlo tree search – stochastic games – partially observable games. Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP	06 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	An Introduction to Game Theory.	M. J. Osborne,	Oxford University Press,	1st	2012
2	Game Theory	M. Machler, E. Solan, S. Zamir,	Cambridge University Press	-	2013

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Game Theory in Wireless And Communication	Zhu Han, DusitNiyato,	Cambridge University	-	2012
2	Algorithmic Game Theory	N. Nisan, T. Roughgarden, E. Tardos, and V. V. Vazirani,	Cambridge University Press	-	2017

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Course Details:

Class	TY B. Tech., Sem. VI
Course Code and Course Title	1ADPE316 **Professional Elective III: Intelligent Precision Agriculture**
Prerequisite/s	1ADPE308
Teaching Scheme: Lecture / Tutorial / Practical	3/0/0
Credits	3
Evaluation Scheme: ISE /MSE/ESE	40/30/30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADPE316_1	**Understand** the applications of AI in agriculture
1ADPE316_2	**Implement** AI tools, Sensors, and GPS in agriculture
1ADPE316_3	**Customize** a greenhouse as per the crop and weather conditions
1ADPE316_4	**Analyze** weather models, their inputs, and applications
1ADPE316_5	**Select** innovative processes, products, and technologies to meet the challenges in agriculture and farming practices

Course Contents:

Unit No.	Unit Name	Hours
Unit 1	**Introduction to Precision Agriculture** History of Mechanized Agriculture - Farming Operations and Related Machines - Tillage, Planting Cultivation, and Harvesting, Agricultural Automation, Monitoring the crop from plantation to harvesting	07 Hrs.
Unit 2	**Precision Agriculture with sensors and GPS** Sensors – types and agricultural applications, Global Positioning System (GPS) - GPS for civilian use, GIS and mapping software, Yield mapping systems, Crop production modeling, Indian Geo Systems,VRT technique for fertilizer recommendation, Agriculture survey by GPS and DGPS	07 Hrs.
Unit 3	**Weather Prediction Model** Importance of climate variability and seasonal forecasting, Understanding and predicting world's climate system, Global climatic models and their potential for seasonal climate forecasting, General systems approach to applying seasonal climate forecasts.	06 Hrs.
Unit 4	**Environment Control System** Artificial light systems, management of crop growth in greenhouses, simulation of CO2 consumption in greenhouses, online measurement of plant growth in the greenhouse, models of plant production	07 Hrs.

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Unit 5	**AI Tools and Techniques** Expert systems like IS, Crop Doctor(CD), Edge Computing Drone technology using AI for agriculture, Image Processing, e-commerce , e-governance, Artificial intelligence, and decision support systems, Multispectral remote sensing for soil mapping.	06 Hrs
Unit 6	**Agriculture System Management and Public Policies** Agricultural systems – managerial overview, Reliability of agricultural systems, Simulation of crop growth and field operations, Research & Development, Need for improved measurement methods, New approaches to research in agriculture	06 Hrs

Text Books:

Sr .No	Title	Author	Publisher	Edition	Year of Edition
1	Precision Agriculture Technology for Crop Farming	Qin Zhang	1st Edition, Kindle Edition	1st	2006
2	A Textbook on Precision Agriculture Technology	Kishore Chandra Swain	New Delhi Publishers Paperback – 1 January 2020	1st	2021

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Agricultural Systems Management	Peart R.M., and Shoup W. D.	Marce Dekker, New York	-	2004
2	Precision Agriculture in the 21st Century	National Research Council	National Academies Press, Canada	-	1997
3	Applications of Seasonal Climate	Hammer, G.L., Nicholls, N., and Mitchell, C.,	Springer, Germany	-	2000

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Course Details:

Class	TY B. Tech., Sem. VI
Course Code and Course Title	1ADPE317- Professional Elective - III : **Artificial Intelligence in Robotics**
Prerequisite/s	1ADPC204
Teaching Scheme: Lecture/Tutorial	3/0/0
Credits	03
Evaluation Scheme: ISE / MSE /ESE	40/30/30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADPE317_1	**Understand** the concept of Artificial Intelligence and methods of solving problems using Artificial Intelligence
1ADPE317_2	**Summarize** applications of AI in Robotics
1ADPE317_3	**Apply** appropriate AI methods to solve assembly problem
1ADPE317_4	**Implement** basic AI algorithms for Speech recognition and making decisions
1ADPE317_5	**Identify** appropriate AI planning methods to solve a given problem
1ADPE317_6	**Develop** learning algorithms for autonomous driving tasks

Course Contents:

Unit No.	Unit Name	Hours
Unit 1	**Introduction** Types of Robot, Technology: Robot classifications and specifications, controls, operations, Sensors : work cell ,Programming languages. History, state of the art, Need for AI in Robotics. Thinking and acting humanly, intelligent agents, and structure of agents.	07 Hrs.
Unit 2	**Problem-Solving** Solving problems by searching: Informed search and exploration, Constraint satisfaction problems, Adversarial search, knowledge and reasoning: knowledge representation, first order logic.	07 Hrs.
Unit 3	**Planning** Planning with forward and backward State space search: Partial order planning, Planning graphs, Planning with propositional logic, Planning and acting in real world.	06 Hrs.
Unit 4	**Reasoning** Uncertainity : Probabilistic reasoning, Filtering and prediction, Hidden Markov models: Kalman filters, Dynamic Bayesian Networks, Speech recognition, making decisions.	06 Hrs.

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Unit 5	**Learning** Forms of learning : Knowledge in learning , Statistical learning methods, reinforcement learning, communication, perceiving and acting, Probabilistic language processing, perception. Usage of learning algorithms in autonomous driving tasks	07 Hrs.
Unit 6	**AI in Robotics** Robotic perception, localization, mapping: configuring space, planning uncertain movements, dynamics and control of movement, Ethics and risks of artificial intelligence in robotics.	06 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Artificial Intelligence: A modern approach	Stuart Russel	Pearson Education	3rd	2009
2	Artificial Intelligence: A guide to Intelligent Systems	Negnevitsky , M,	Harlow: Addison-Wesley,	3rd	2011

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Artificial Intelligence: Foundations of Computational Agents	David L. Poole and Alan K. Mack worth	Cambridge University Press	3rd	2023
2	Artificial Intelligence: A Systems Approach	Tim Jones M,	Jones & Bartlett Learning.	1st	2009
3	A first course in Artificial Intelligence	Deepak Khemani	McGraw Hill, India	6th	2018

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Course Details:

Class	TY B. Tech., Sem. VI
Course Code and Course Title	1ADPE318- **Advanced Databases**
Prerequisite/s	1ADPC210
Teaching Scheme: Lecture/Tutorial/Practical	3/0/0
Credits	03
Evaluation Scheme: ISE / MSE /ESE	40/30/30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADPE318_1	**Understand** the key techniques and theory for SQL Queries
1ADPE318_2	**Understand** the basics of using Database and Engineering Basics
1ADPE318_3	**Apply** the Theoretical Knowledge of Data Science and SQL
1ADPE318_4	**Apply** the Data Interconnectivity between SQL and Python
1ADPE318_5	**Analysis** the various Platform and analyses the Python basics

Course Contents:

Unit No.	Unit Name	Hours
Unit 1	**Distributed Databases** Distributed Systems – Introduction – Architecture – Distributed Database Concepts – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing.	07 Hrs.
Unit 2	**Spatial and Temporal Databases** Active Databases Model – Design and Implementation Issues - Temporal Databases - Temporal Querying - Spatial Databases: Spatial Data Types, Spatial Operators and Queries – Spatial Indexing and Mining – Applications — Mobile Databases: Location and Handoff Management, Mobile Transaction Models – Deductive Databases - Multimedia Databases.	07 Hrs.
Unit 3	**Nosql Databases** NoSQL – CAP Theorem – Sharding - Document based – MongoDB Operation: Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding–Cassandra: Data Model, Key Space, Table Operations, CRUD Operations, CQL Types – HIVE: Data types, Database Operations, Partitioning – HiveQL – Orient DB Graph database – Orient DB Features	06 Hrs.

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Unit 4	**XML Databases** Structured, Semi structured, and Unstructured Data – XML Hierarchical Data Model – XML Documents – Document Type Definition – XML Schema – XML Documents and Databases – XML Querying – XPath – XQuery	06 Hrs.
Unit 5	**IR / WEB Databases** IR concepts – Retrieval Models – Queries in IR system – Text Preprocessing – Inverted Indexing – Evaluation Measures – Web Search and Analytics – Current trends, WebDB.	06 Hrs.
Unit 6	**SQLITE with Python** Uses of SQLite-Insert Data-Types of Clauses (ORDER BY, LIMIT, JOIN, INSERT, WHERE)-Virtual machine-Code Generator-B-Tree, Page cache- Parser-Tokenizer.	07 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Database Systems	Thomas M. Connolly, Carolyn E. Begg,	Pearson Education	6th	2015.
2	Fundamentals of Database Systems,	Rich and Knight	The McGraw Hill	3rd	2017

Reference Books:

Sr. No	**Title**	Author	Publisher	Edition	Year of Edition
1	Database Modeling And Design - Logical Design	Toby Teorey, Sam Lightstone, Tom Nadeau, H. V. Jagadish,	Morgan Kaufmann Publishers	5th	2011

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Course Details:

Class	B. Tech., Sem. VII
Course Code and Course Title	1ADAI319 **Minor Course-2 Information Retrieval**
Prerequisite/s	1ADVS206
Teaching Scheme: Lecture/Tutorial/Practical	3/0/0
Credits	03
Evaluation Scheme: ISE / MSE / ESE	40/30/30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADAI319 _1	**Understand** the concept of Information retrieval and to apply clustering in information retrieval.
1ADAI319 _2	**Use** an indexing approach for retrieval of text and multimedia data.
1ADAI319 _3	**Use** appropriate tools in analyzing the web information.
1ADAI319 _4	**Apply** the concepts of multimedia and distributed information retrieval.
1ADAI319_5	**Evaluate** performance of information retrieval systems.

Course Contents:

Unit No.	Unit Name	Hours
Unit 1	**Introduction to Information Retrieval** Basic Concepts of IR, Data Retrieval & Information Retrieval, Text mining and IR relation, IR system block diagram, Automatic Text Analysis: Luhn's ideas, Conflation Algorithm, Indexing and Index Term Weighting, Probabilistic Indexing, Automatic Classification. Measures of Association, Different Matching Coefficients, Cluster Hypothesis, Clustering Techniques: Rocchio's Algorithm, Single pass algorithm, Single Link algorithm.	07 Hrs
Unit 2	**Indexing and Searching Techniques** Indexing: Inverted file, Suffix trees & suffix arrays, Signature Files, Scatter storage or hash addressing. Searching Techniques: Boolean Search, sequential search, Serial search, cluster-based retrieval, Query languages, Types of queries, Patterns matching, structural queries	07 Hrs
Unit 3	**Evaluation and Visualization of Information Retrieval System** Performance evaluation: Precision and recall, MRR, F-Score, NDCG, user-oriented measures. . IR Models: Basic concepts, Boolean Model, Vector Model, Probabilistic Model.	06 Hrs

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Unit 4	**Visualization in Information System:** Starting points, Query Specification, document context, User relevance judgment, Interface support for search process.	06 Hrs
Unit 5	**Distributed and Multimedia IR** Distributed IR: Introduction, Collection Partitioning, Source Selection, Query Processing, And Multimedia IR: Introduction, Data Modeling, Query Language, Background-Spatial Access Method, A Generic Multimedia Indexing Approach, One Dimensional Time Series, Two-Dimensional color Images, Automatic Feature Extraction, Trends and Research Issue.	06 Hrs
Unit 6	**Advanced Information Retrieval** XML Retrieval: Basic XML concepts, Challenges in XML retrieval, Vector space model for XML retrieval, Evaluation of XML retrieval, Text-Centric vs. Data-Centric XML retrieval. Recommendation system: Collaborative Filtering and Content Based Recommendation of Documents and Products. Introduction to Semantic Web.	07 Hrs

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Modern Information Retrieval	Ricardo Baeza-Yates, Berthier Riberio–Neto	Springer	2nd	2010
2.	Recommender Systems Handbook	Ricci F, Rokach L, Shapira B, Kantor P	Springer	1st	2010

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Information retrieval	C. J. van RIJSBERGEN	C. J. van RIJSBERGEN	2nd	2012
2.	Advances in XML Information Retrieval and Evaluation	Norbert Fuhr, MouniaLalmas, Saadia Malik, Gabriella Kazai	Springer New York	1st	2005

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Course Details:

Class	TY B. Tech., Sem. VI
Course Code and Course Title	**1ADEL320 Mini Project**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	0/0/4
Credits	2
Evaluation Scheme: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADEL320_1	**Identify** specific problem from selected domain.
1ADEL320_2	**Analyze** the hardware and/or software requirements of the proposed work.
1ADEL320_3	**Identify** and use relevant tools and technologies for documentation, designing, coding, testing and debugging software / hardware pertaining to their mini project.
1ADEL320_4	**Design** a software system, components, or process to meet desired needs.
1ADEL320_5	**Appraise** the result obtained during mini project work
1ADEL320_6	**Develop** summarizing, writing, documentation, and presentation skills to showcase their project work leading to effective communication.

Course Contents: **Platforms:** Free and open source software	
1	Three students (Maximum) in a group shall carry out a mini project. A batch of practical / shall be divided into mini project groups.
2	Mini project topics and the work for these groups in the batch shall be guided by a teacher for the batch, preferably on one of the topics which is selected by a students in his / her domain.
3	Alternatively, a group may select another topic of relevance in consultation with senior students and teachers.
4	A group shall undertake IBM TGMC (The Great Mind Challenge) projects, past Smart India Hackathon, KPIT Sparkle topic Or the topic related to courses the student have studied / studying.
5	The teacher shall periodically assess the performance of individual student in the mini project jointly with a teacher of another batch. This assessment will be used for determining ISE marks of the mini project.
6	Project group shall submit hardcopy of project report along with related code and documentation in soft form at the end of semester.

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Annasaheb Dange College of Engineering and Technology
Artificial Intelligence and Data Science Department

Course Details:

Class	TY B. Tech., Sem. VI
Course Code and Course Title	1ADCC321 **Aptitude and Reasoning Part-IV**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial /Practical	0/0/2
Credits	01
Evaluation Scheme: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADCC321 _ 1	Solve problem based on basic and advance probability, Permutation and Combination
1ADCC321 _2	Solve problem based on Syllogism, graphs, data interpretations, Arithmetic, Calendar
1ADCC321 _3	Solve problem based on gaming round
1ADCC321 _ 4	Demonstrate Verbal skills and Interview Skills

Course Contents:

Unit No.	Unit Name	Hours
Unit 1	Advance Probability: Advance Permutation Combination	4 Hrs
Unit 2	Statement Assumption, Syllogism	4 Hrs
Unit 3	Mixed Bar Graph, Pie Chart Data Interpretation(Avg & Ratio Proportion based)	4 Hrs
Unit 4	Gaming Round OR Capgemini Part 1 Gaming Round OR Capgemini Part 2	4 Hrs
Unit 5	Company Specific Revision for Arithmetic (S.T.D., Time RateWork) Revision of Calendar Reminder theorem Power Cycle	4 Hrs
Unit 6	Verbal Ability Revision Part 1 Verbal Ability Revision Part 2 Interview Etiquettes & Grooming	4 Hrs

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Quantitative Aptitude for Competitive Examinations	R.S. Agarwal	S Chand		2022
02	Verbal and Non-verbal Reasoning	R.S. Agarwal	S Chand		2010
03	Verbal, Grammar	P.C.Wren	S Chand		2017

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Annasaheb Dange College of Engineering and Technology, Ashta

Department of Artificial Intelligence and Data Science

Structure and Curriculum Contents

B.Tech (Final Year)

Revision - 1

SEM-VII to SEM-VIII

W.E.F Academic Year 2025-26

Annasaheb Dange College of Engineering and Technology

Department of Artificial Intelligence and Data Science

Teaching and Evaluation Scheme

Final Year. B. Tech Semester VII

Course Code	Course Name	Teaching Scheme				THEORY							PRACTICAL						GRAND TOTAL
						ISE		MSE + ESE			Total	Min	ISE		ESE		Total	Min	
		L	T	P	Credits	Max	Min	MSE	ESE	Min			Max	Min	Max	Min			
2ILOE451	Open Elective - III	2	-	-	2	50	20	-	-	-	50	20	-	-	-	-	-	-	50
1ADPC401	Generative AI	3	-	2	4	40	16	30	30	24	100	40	50	20	50	20	100	40	200
1ADPC402	Natural Language Processing	3	-	2	4	40	16	30	30	24	100	40	50	20	50	20	100	40	200
1ADHS403	Project Management and Finance	2	-	-	2	40	16	30	30	24	100	40	-	-	-	-	-	-	100
1ADPE4**	Professional Elective - IV	2	-	2	3	40	16	30	30	24	100	40	50	20	-	-	-	-	150
1ADAI408	Minor course - 4^ Machine Learning	3	-	-	3	40	16	30	30	24	100	40	-	-	-	-	-	-	100
1ADPC409	Big Data Analytics	1	-	2	2	-	-	-	-	-	-	-	50	20	-	-	50	20	50
1ADEL410	Project	-	-	8	4	-	-	-	-	-	-	-	50	20	50	20	100	40	100
		16	0	16	24														950
	Total Contact Hours	32																	

For Open Elective-III, students must complete NPTEL Course offered by the institute

Professional Elective - IV	
1ADPE404	Data Warehousing and Business Intelligence
1ADPE405	Genetic Algorithm and Optimization
1ADPE406	Quantum Computing
1ADPE407	AI in Healthcare

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Member Secretary-BoS Chairman-BoS Member Secretary-AC Chairman-AC

Annasaheb Dange College of Engineering and Technology

Department of Artificial Intelligence and Data Science

Teaching and Evaluation Scheme																			
Final Year B. Tech Semester VIII																			
Course Code	**Course Name**	**Teaching Scheme**				**THEORY**							**PRACTICAL**						**GRAND TOTAL**
						ISE		**MSE+ ESE**			**Total**	**Min**	**ISE**		**ESE**		**Total**	**Min**	
		L	**T**	**P**	**Credits**	**Max**	**Min**	**MSE**	**ESE**	**Min**			**Max**	**Min**	**Max**	**Min**			
1ADPE4**	Professional Elective - V (MOOC)	3	-	-	3	40	16	30	30	24	100	40	-	-	-	-	-	-	100
1ADAI415	Minor Project ^ Applied Artificial Intelligence	-	-	6	3	-	-	-	-	-	-	-	50	20	50	20	100	40	100
1ADEL416	Internship	-	-	20	10	-	-	-	-	-	-	-	100	40	-	-	100	40	100
		3	**0**	**26**	**16**														**300**
	Total Contact Hours	**3 + Internship**																	

Professional Elective - V (MOOC)	
1ADPE411	Introduction to Large Language Models (LLM)
1ADPE412	Programming in Java
1ADPE413	Blockchain and its Applications
1ADPE414	Augmented Reality and Virtual Reality

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Member Secretary-BoS **Chairman-BoS** **Member Secretary-AC** **Chairman-AC**

Course Details:

Class	B. Tech, Sem. VII
Course Code & Course Title	**1ADPC401 Generative AI**
Prerequisite/s	1ADPC303, 1ADPC314
Teaching Scheme (Lecture /Tutorial/ Practical)	3/0/2
Total Contact Hours:	39 Hours
Credits	04
Theory Evaluation Scheme: ISE/ MSE /ESE	40/30/30
Practical Evaluation Scheme: ISE/ESE	50/50

Course Outcomes (COs) :	
Upon successful completion of the course, the students will be able to:	
1ADPC401_1	**Identify** the principles of generative models and apply Generative Adversarial Networks (GANs) to generate synthetic data by implementing a basic GAN model.
1ADPC401_2	**Implement** deep generative models for image, audio, and text data synthesis.
1ADPC401_3	**Analyze** the architecture and working mechanisms of transformer-based generative models for text generation and natural language understanding.
1ADPC401_4	**Develop** multimodal generative systems for cross-domain tasks like text-to-image generation and voice synthesis.
1ADPC401_5	**Apply** advanced generative AI techniques - Retrieval-Augmented Generation (RAG), Vision Conditional Architectures (VCA), and cloud-based deployment to enhance AI-driven applications.
1ADPC401_6	**Analyze** the ethical implications and societal impact of generative AI.

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Introduction to Generative AI:** Introduction to Generative Models, Probabilistic Models, Categories of Generative AI (GANs, VAEs, Diffusion Models, Transformers), Sampling Methods, Implementing a Basic GAN, AI Frameworks (PyTorch, TensorFlow, Hugging Face)	07 Hrs.
Unit 2	**Deep Generative Models for Multimodal Synthesis:** Advanced GAN Architectures, Multimodal Data Synthesis (Image, Audio, and Text), Deepfake Generation, Image Super-resolution, Voice Synthesis, Text-to-Image Models, Training Challenges & Solutions	06 Hrs.

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Unit 3	**Transformer-Based Generative AI and Large Language Models (LLMs):** Introduction to Transformers, Self-Attention, Multi-Head Attention, Architecture of Transformer Models, Evolution of GPT (GPT-2 to GPT-4), Fine-Tuning LLMs, Chatbots, Summarization, Code Generation (Codex)	06 Hrs.
Unit 4	**Multimodal Generative Systems:** Cross-Domain Generative Models, Text-to-Image Generation, Voice Synthesis, Multimodal Fusion, Applications in Human-Computer Interaction, Evolution from GPT-2 to GPT-4, Fine-tuning Large Language Models, Applications of LLMs: Automated content generation, personalized responses, conversational AI, code generation (Codex).	07 Hrs.
Unit 5	**Advanced Applications of Generative AI:** **Retrieval-Augmented Generation (RAG)**: Concept and architecture of RAG, Integrating external knowledge bases with Generative AI. **Vision Conditional Architectures (VCA):** Overview of VCAs, Combining image features with generative models. **Cloud Generative AI:** Overview of Cloud AI platforms, Deployment and scaling Generative AI models. **Image Masking and Editing:** Techniques for image masking, Applications in photo editing, inpainting, and background removal, Tools and frameworks.	07 Hrs.
Unit 6	**Generative AI Ethics, Responsible AI, and Industry Applications:** Ethics in Generative AI: Deepfakes, AI-generated art, Responsible AI: Fairness, explainability, accountability, transparency, and safety in the deployment of generative AI systems, Industrial Use Cases: Generative AI in autonomous vehicles, healthcare, Hands-on Ethical AI Challenges: Case studies on AI bias, AI ethics in deep fake creation, policy issues, and regulations,	06 Hrs.

Experiment List:	
1	Implement Generative Models with Simple Autoencoders
2	Implement Variational Autoencoders (VAEs)
3	Train a Basic Generative Adversarial Network (GAN)
4	Implement Conditional GAN (cGAN) for Image-to-Image Translation
5	Implement a Transformer-based Text Generator using GPT-2/GPT-3
6	Implement RAG for dynamic chatbot systems using Hugging Face Transformers.
7	Perform image masking and editing using AI tools like Stable Diffusion
8	Deploy a text-to-image model on a cloud platform (e.g., DALL-E on Google Cloud)
9	Implement AI Art and Deepfakes with GANs
10	Case study on AI bias, AI ethics in deep fake creation, policy issues, and regulations

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Text Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1	Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play	David Foster	O'Reilly Media	2nd	2023
2	Deep Learning	Ian Goodfellow, YoshuaBengio, and Aaron Courville	The MIT Press	1st	2016
3	Transformers for Natural Language Processing	Denis Rothman	Packt Publishing	1st	2021

Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1	Hands-On Generative Adversarial Networks with PyTorch 1.x	John H. Ramey	Packt Publishing	1st	2020
2	Deep Reinforcement Learning Hands-On	Maxim Lapan	Packt Publishing	2nd	2020
3	Generative AI: Text, Image, and Beyond	Trevor Cox	McGraw-Hill Education	1st	2024

Online Resources:		
Sr. No	**Link**	**QR Codes**
1.	**https://onlinecourses.nptel.ac.in/noc25_cs137/preview**	
2.	**https://www.coursera.org/learn/generative-ai-introduction-and-applications**	
3.	**https://microsoft.github.io/generative-ai-for-beginners/#/**	

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ANNASAHEB DANGE COLLEGE OF ENGINEERING & TECHNOLOGY ASHTA 416 301

Course Details:

Class	B. Tech, Sem. VII
Course Code & Course Title	**1ADPC402 Natural Language Processing**
Prerequisite/s	1ADPC303
Teaching Scheme (Lecture /Tutorial/ Practical)	3/0/2
Total Contact Hours:	39 Hours
Credits	04
Theory Evaluation Scheme: ISE/MSE/ESE	40/30/30
Practical Evaluation Scheme: ISE/ESE	50/50

Course Outcomes (COs) : Upon successful completion of the course, the students will be able to:	
1ADPC402_1	**Explain** Fundamental concepts of NLP, Challenges and issues in NLP.
1ADPC402_2	**Apply** Traditional NLP Techniques to solve basic NLP problems.
1ADPC402_3	**Analyze** Linguistic Structures and Examine the processes of sequence labeling, constituency parsing, and semantic role labeling.
1ADPC402_4	**Evaluate** Word Senses and Semantic Similarity using WordNet , Compare different measures of WordNet similarity and understand Indian Language Word-nets.
1ADPC402_5	**Design** Parsing Techniques to understand NLP applications

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Introduction** Introduction to NLP, Machine Learning and NLP, Biology of Speech Processing; Place and Manner of Articulation, Word Boundary Detection, Arg-Max Computation, Lexical Knowledge Networks.	07 Hrs.
Unit 2	**Traditional NLP Techniques** Rule-based systems and regular expressions, Statistical language models, Part-of-speech tagging, Named entity recognition, Dependency parsing.	06 Hrs.
Unit 3	**Annotating Linguistic Structure** Sequence Labeling for Parts of Speech and Named Entities, Context-Free Grammars and Constituency Parsing, Lexicons for Sentiment, Affect, and Connotation, Semantic Role Labeling and Argument Structure	06 Hrs.
Unit 4	**Word Senses and WordNet** Semantic Roles, Word Sense Disambiguation (WSD): Word-Net, Word-net Application in Query Expansion, Wiktionary, semantic relatedness, Measures of Word-Net Similarity, Similarity Measures. Resnick's work on Word-Net Similarity, Indian Language Word-nets.	07 Hrs.

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Unit 5	**Theories of Parsing** Introduction to Parsing, Parsing Algorithms: Top-down, Bottom-up, Shift-reduce ,Noun vs. Non-noun Structure, Robust& Scalable Parsing, Probabilistic Parsing, Hybrid Approaches, Dependency Parsing, Ambiguity Resolution.	07 Hrs.
Unit 6	**NLP Applications** Machine Translation, Information Retrieval, and RAG, Chatbots and Dialogue Systems, Automatic Speech Recognition and Text-to-Speech	06 Hrs.

Experiment List:	
1	Implement tokenization by word and sentence.
2	Implement Parts of Speech tagging in NLP.
3	Implement Named Entity Recognition.
4	Perform pre-processing (Tokenization, stopword removal and stemming) of Text.
5	Perform bag-of-words approach (count occurrence, normalized count occurrence), TF-IDF on data. Create embeddings using Word2Vec.
6	Implement sentiment analysis using Natural Language Processing (NLP) techniques.
7	Implement the CYK (Cocke–Younger–Kasami) parsing algorithm or Chart Parsing technique.
8	Implement a program to build a spam filter using Natural Language Processing (NLP)
9	Implement a program to detect fake news using Natural Language Processing (NLP) techniques.
10	Micro-project: students work in a team on any application of NLP.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and speech Recognition	Jurafsky/Martin	Pearson Publication	3rd	Feb 2024
02	Foundations of statistical Natural Language Processing ,Cambridge	Christopher Manning Hinrich Schuetze	MA:MIT press	-	1999

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Natural Language Processing with Python-Analyzing text with Natural Language Toolkit	Steven Bird, Ewan Klein, Edward Loper	O'Reilly Publication	-	2009

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02	The Handbook of Computational Linguistics and Natural Language Processing	Alexander Clark	Wiley Blackwell Publications	-	2010

Online Resources:		
Sr. No	**Link**	**QR Code**
1.	**https://onlinecourses.nptel.ac.in/noc23_cs45/preview**	
2.	**https://www.youtube.com/watch?v=zlUpTlaxAKI&list=PLKnIA16_RmvZo7fp5kkIth6nRTeQQsjfX**	
3.	**https://www.coursera.org/in/articles/natural-language-processing**	

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Course Details:

Class	B.Tech., Sem- VII
Course Code and Course Name	**1ADHS403 -Project Management and Finance**
Prerequisite	NIL
Teaching Scheme: Lecture/Tutorial/Practical	02/00/00
Credits	02
Evaluation Scheme : ISE/MSE/ESE	40/30/30

Course Outcomes(CO's): After successful completion of this course, the student will be able to,	
1ADHS403_1	**Apply** project management principles to initiate, plan, execute, monitor, and control projects.
1ADHS403_2	**Analyze** project feasibility by considering technical, economic, and financial aspects.
1ADHS403_3	**Estimate** project costs, schedule tasks, and allocate resources effectively.
1ADHS403_4	**Identify** and mitigate project risks using appropriate techniques.
1ADHS403_5	**Apply** financial principles to project budgeting, cash flow management, and investment appraisal.
1ADHS403_6	**Effectively** communicate project plans, progress, and results to stakeholders.

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Project Fundamentals** Definition and characteristics of a project, Project life cycle and its phases, Project management methodologies (e.g., Agile, Waterfall, Scrum), Stakeholder analysis and management, Introduction to Project Management Professional (PMP) framework	04 Hrs.
Unit 2	**Project Planning & Scheduling** Work Breakdown Structure (WBS) development, Activity definition and sequencing, Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT), Resource allocation and leveling, Project scheduling tools (e.g., Gantt charts, MS Project)	04 Hrs
Unit 3	**Project Cost & Risk Management** Cost estimation techniques (e.g., Parametric, Analogous, Bottom-up), Cost budgeting and control, Earned Value Management (EVM), Cost-benefit analysis and return on investment (ROI), Risk identification and assessment, Qualitative and quantitative risk analysis technique, Risk response planning (mitigation, avoidance, transference, acceptance), Contingency planning and reserves	05 Hrs.

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Unit 4	**Project Execution and Control** Activity Planning, Team Building and Management, Stakeholder Engagement, Project Monitoring & Control Performance Measurement, Change Management, Issue Resolution, Quality Management : Quality Planning, Quality Assurance, Continuous Improvement, Project Challenges and Solutions	04 Hrs.
Unit 5	**Project Communication & Finance** Communication planning and channels, Stakeholder communication strategies, Report writing and presentations, Conflict resolution and negotiation, Time value of money concepts, Capital budgeting techniques(e.g.,NPV,IRR,Payback period),Sources of project finance(e.g.,loans, equity, grants), Financial statement analysis for project evaluation	04 Hrs.
Unit 6	**Project Closure & Review** Project completion and handover, Project closure procedures, Post-project evaluation and lessons learned Project audits and reviews, Professional ethics and responsibilities in project management	05 Hrs.

Text Books:

Sr.No	Title	Authors	Publisher	Edition	Year of Edition
1	A Guide to the Project Management Body of Knowledge	-	Project Management Institute (PMI)	7th	2021
2	Project Management: The Managerial Process	ErikW.Larson & Clifford F. Gray	McGraw Hill	6th	2017
3	Project Finance: In Theory and Practice	Stefano Gatti	Academic Press	-	2007

Online Resources:

Sr. No	Link	QR Code
1.	**https://onlinecourses.nptel.ac.in/noc25_mg153/preview**	
2.	**https://www.youtube.com/watch?v=SJcHiiNpUds**	
3	**https://www.youtube.com/watch?v=wk5EPfDYNJo**	

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Course Details:

Class	B. Tech, Sem. VII
Course Code & Course Title	**1ADPE404 Data Warehousing and Business Intelligence**
Prerequisite/s	1ADPC202,1ADPC210
Teaching Scheme (Lecture /Tutorial/ Practical)	2/0/2
Total Contact Hours:	26 Hours
Credits	03
Theory Evaluation Scheme: ISE/ MSE /ESE	40/30/30
Practical Evaluation Scheme: ISE	50

Course Outcomes (COs) : Upon successful completion of the course, the students will be able to:	
1ADPE404_1	**Summarize** the key concepts of Data Warehousing and data warehouse schemas for different use cases.
1ADPE404_2	**Apply** design strategies to build efficient Data Warehouses and Ensure data quality and consistency in the ETL process.
1ADPE404_3	**Execute** OLAP operations for effective data analysis and Use BI tools to perform data analysis and mining
1ADPE404_4	**Explain** the fundamentals of Business Intelligence and its architecture.
1ADPE404_5	**Design** BI reports and dashboards for visualization.
1ADPE404_6	**Analyze** the role of BI in decision-making across various industries and implement real-world BI applications.

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Introduction to Data Warehousing** Overview of Data Warehousing, Data Warehouse Architecture and Components, Data Warehouse vs. Operational Databases Data Warehouse Modeling: Star Schema, Snowflake Schema Fact Tables, Dimension Tables, and Their Relationships	05 Hrs.
Unit 2	**Data Warehouse Design and ETL Process** Data Warehouse Design: Bottom-up, Top-down, Hybrid Approaches **ETL Process:** Extraction, Transformation, and Loading	04 Hrs.
Unit 3	**OLAP and Data Mining Techniques** OLAP Operations: Slice, Dice, Roll-up, Drill-down. Data Mining Fundamentals: Classification, Clustering, Association Rules.	04 Hrs.

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Unit 4	**Introduction to Business Intelligence** Overview and Components of Business Intelligence, Business Intelligence Architecture, Types of BI Analytics: Descriptive, Predictive, and Prescriptive,	04 Hrs.
Unit 5	**Business Intelligence Reporting and Dashboards** BI Reporting Concepts and Techniques,**Types of Reports:** Static, Dynamic, Ad-hoc,Key Performance Indicators (KPIs) and Metrics Tools for BI Reporting (Power BI, Tableau, SAP BO)	05 Hrs.
Unit 6	**Case Studies, BI Applications, and Trends** Real-world Applications of BI in Industries (e.g., Retail, Finance, Healthcare), Emerging Trends in BI . Case Study 1: BI for Decision-Making Case Study 2: BI for Healthcare Analytics.	04 Hrs.

Experiment List:	
1	**Building a Simple Star Schema Data Warehouse** • Create a Fact Table and two Dimension Tables for a retail sales scenario (e.g., Fact_Sales, Dim_Date, Dim_Product). • Define relationships between the tables. • Load sample data into the tables. • Write a simple SQL query to analyze total sales by product category.
2	**Build ETL Process for a Data Warehouse** • Extract data from two different source systems (e.g., CSV files, a database). • Transform the data: • Clean and handle missing values. • Convert data types. • Aggregate data. • Derive new columns. • Load the transformed data into the target tables in your data warehouse.
3	**Implement OLAP Operations with a Cube** • Create a simple OLAP cube using a tool like Mondrian or Pentaho. • Perform slice, dice, roll-up, and drill-down operations on the cube. • Analyze the results of each operation.
4	**Creating a Basic Business Intelligence Dashboard** • Choose a BI tool (e.g., Tableau, Power BI). • Connect to a data source (e.g., your data warehouse). • Create visualizations (e.g., bar charts, pie charts, line graphs) to represent key metrics. • Arrange the visualizations on a dashboard and add filters and interactions.
5.	**Micro project:** Create a professional dashboard with any business case study by using Tableau or Power BI

Text Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Business Intelligence: A Managerial Perspective on Analytics	Ramesh Sharda, DursunDelen, Efraim Turban	Pearson	9th	2021
02	Business Intelligence Guidebook: From Data Integration to Analytics"	Rick Sherman	Morgan Kaufmann	1st	2014

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Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1	Data Warehousing: Concepts, Techniques, Products and Applications	Arun K. Pujari	Pearson Education	1st	2002
2	Business Intelligence and Analytics: Systems for Decision Support	Ramesh Sharda, DursunDelen, Efraim Turban	Pearson	10th	2018

Online Resources:		
Sr. No	**Link**	**QR Code**
1	**https://onlinecourses.nptel.ac.in/noc21_cs06/preview**	
2	**https://onlinecourses.nptel.ac.in/noc24_cs65/preview**	
3	**https://www.youtube.com/watch?v=J326LIUrZM8**	

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Annasaheb Dange College of Engineering and Technology

Artificial Intelligence and Data Science Department

Course Details:

Class	B. Tech, Sem. VII
Course Code & Course Title	**1ADPE405 Genetic Algorithms and Optimization**
Prerequisite/s	1ADPC301
Teaching Scheme (Lecture Practical/Tutorial)	2/0/2
Total Contact Hours:	26 Hours
Credits	03
Theory Evaluation Scheme: ISE/ MSE /ESE	40/30/30
Practical Evaluation Scheme: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1ADE405_1	**Identify** the mathematical foundations and working principles of Genetic Algorithms (GAs) in solving optimization problems.
1ADE405_2	**Implement** Genetic Algorithms for solving optimization problems by mapping objective functions to fitness forms, applying fitness scaling techniques
1ADE405_3	**Analyze** operators and techniques in genetic algorithms
1ADE405_4	**Use** a Classifier System to solve simple optimization problems
1ADE405_5	**Apply** modern optimization methods to solve basic problems

Course Contents:

Unit No	Unit Name	Contact Hours
Unit 1	**Basics of genetic and optimization algorithms** Key Concepts in Genetic Algorithms, Genetic Algorithm Process, Use of Genetic Algorithms, Traditional algorithm vs genetic algorithm, Introduction and Classical Optimization Techniques: Statement of an Optimization problem, design vector, design constraints	4 Hrs.
Unit 2	**Mathematical Foundations and Optimization Strategies** Genetic Algorithms Revisited: Mathematical Foundations: The fundamental theorem - Schema Processing at work: An example by hand revisited(Initialization, Crossover, Mutation, Reproduction), Constrained and Unconstrained Optimization :Penalty methods ,Gradient descent method	4 Hrs.
Unit 3	**Genetic Algorithms and Optimization Methods** Mapping Objective Functions to Fitness Forms, Fitness Scaling Techniques, Coding Methods, Multi-parameter Mapped Fixed Point Coding, Classical and Numerical Optimization Methods.	5 Hrs.
Unit 4	**Advanced Operators and Optimization Techniques** Dominance, Diploidy and Abeyance, Inversion and other reordering Operators, Other Micro Operators, Niche and Speciation, Multi Objective Optimization, Knowledge Based optimization.	4 Hrs.

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Unit 5	**Classifier System** Classifier System, Types Of Classifier System- Rule and Message system, Apportionment of Credit Algorithm-The Bucket Brigade Algorithm, Genetic Algorithm, A simple Classifier system, Results using simple classifier system, GBML System.	5 Hrs.
Unit 6	**Modern Methods in Optimization** Simulated Annealing, Particle Swarm Optimization, Neural Network based optimization, Optimization of Fuzzy systems, Multi-Objective optimization, Data Analytics and optimization using Machine learning approach.	4 Hrs.

Experiment List:	
1	Implement a simple Genetic Algorithm for a function optimization problem (e.g., finding the maximum of a polynomial).
2	Use different parameter settings (population size, crossover rate, mutation rate) and observe their impact on the GA's performance.
3	Implement different fitness scaling techniques and compare their effects on convergence.
4	Implement a GA using different coding methods for a given problem and analyze the results.
5	Implement a GA to solve a constrained optimization problem, demonstrating constraint handling techniques.
6	Implement a GA with advanced operators like inversion or other reordering operators and compare its performance with a basic GA.
7	Implement a multi-objective GA to solve a problem with multiple conflicting objectives.
8	Implement a simple classifier system with a rule and message system and the Bucket Brigade Algorithm for credit apportionment.
9	Implement a basic Genetics Based Machine Learning system and apply it to a simple classification problem.
10	Micro Project

Text Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Learning Genetic Algorithms with Python	Ivan Gridin	BPB publication	1st Edition	2021
2.	Introduction to Genetic Algorithms	Mitchell Melanie	MIT press	Fifth printing	1999

Reference Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Genetic Algorithms in Search, Optimization & Machine Learning	David e Goldberg	Addison Wesley	1st Edition	1989
2.	Introduction to Genetic Algorithms	Mitchell Melanie	MIT press	5th printing	1999

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3.	Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications	S. Rajsekaran and G.A. Vijayalakshmi Pai	Prentice Hall of India	2nd Edition	2017

Online Resources:		
Sr. No	**Link**	**QR Code**
1.	**https://qrco.de/bg8I5A**	
2	**https://www.classcentral.com/course/udemy-optimization-with-genetic-algorithms-hands-on-python-403943**	
3	**https://qrco.de/bg8PYe**	

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Course Details:

Class	B. Tech, Sem. VII
Course Code & Course Title	**1ADPE406 Quantum Computing**
Prerequisite/s	1ADPC301
Teaching Scheme (Lecture /Tutorial/ Practical)	2/0/2
Total Contact Hours:	26 Hours
Credits	03
Theory Evaluation Scheme: ISE/ MSE /ESE	40/30/30
Practical Evaluation Scheme: ISE	50

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1ADPE406_1	**Apply** the fundamental principles of quantum mechanics, quantum parallelism and quantum evolution to implement basic quantum algorithms.
1ADPE406_2	**Apply** advanced quantum algorithms to solve real-world computational problems.
1ADPE406_3	**Use** quantum information science and error correction techniques to manage quantum noise and entropy.
1ADPE406_4	**Implement** quantum programs using quantum programming languages and quantum cryptography protocols.
1ADPE406_5	**Explore** advanced quantum computing applications in machine learning, optimization, and future trends and challenges.

Course Contents:

Unit No	Unit Name	Contact Hours
Unit 1	**Introduction to Quantum Computing** Basics of Quantum Mechanics, Complex Numbers and Geometrical Representations, Complex Vector Spaces and Hilbert Spaces, Hermitian and Unitary Matrices, Qubits: Representation, Operations, and Measurement, Quantum Circuit Composition, Quantum Postulates, Dirac Notation (Bra-Ket), Quantum Gates	5 Hrs.
Unit 2	**Quantum Algorithms I** Quantum Parallelism, Quantum Evolution, Deutsch's Algorithm, Deutsch-Jozsa Algorithm, Simon's Periodicity Algorithm, quantum Fourier transform , Amplitude Amplification, Quantum Phase Estimation, Basic Applications of Quantum Fourier Transform	4 Hrs.
Unit 3	**Quantum Algorithms II** Grover's Search Algorithm, Shor's Factoring Algorithm, Quantum Teleportation, Superdense Coding, Applications of Entanglement, quantum superposition, Variational Quantum Algorithms , Quantum Walks, Quantum Annealing	4 Hrs.

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Unit 4	**Quantum Information Science** Quantum Noise, Quantum Error-Correction Techniques,quantum error correction code, Distance Measures for Quantum Information, Entropy and Information in Quantum Systems, Quantum Information Theory, Stabilizer Codes,Quantum Channels	4 Hrs.
Unit 5	**Quantum Programming and Cryptography** Quantum Programming Languages (e.g., Qiskit, Cirq), Probabilistic and Quantum Computations, Quantum Cryptography, Quantum Key Distribution (QKD), Post-Quantum Cryptography, BB84 quantum key distribution protocol,Advanced Cryptographic Protocols:	4 Hrs.
Unit 6	**Advanced Topics and Applications** Quantum Machine Learning, Quantum Computing in Optimization Problems, Quantum Simulation of Physical Systems, Quantum Computing in Artificial Intelligence, Future Trends and Challenges in Quantum Computing , Ethical Implications of Quantum Computing.	5 Hrs.

Experiment List:	
1	Simulate a single qubit and apply basic gates (X, Y, Z, H) using Qiskit/Cirq library.
2	Constructing and Simulating a Quantum Circuit with Qiskit to Demonstrate Superposition and Measurement
3	Implement Deutsch's algorithm with a basic quantum oracle to demonstrate quantum parallelism.
4	Create entangled quantum states using Hadamard and CNOT gates, and measure the correlation between qubits.
5	Implement Grover's algorithm for a small search space (2 qubits) and demonstrate amplitude amplification.
6	Implement a simple quantum error correction code (e.g., 3-qubit repetition code) to detect and correct bit-flip errors
7	Implement a simple quantum teleportation protocol using entanglement between Alice and Bob.
8	Implement the quantum Fourier transform on a 2-qubit system and observe the transformation.
9	Use quantum superposition and measurement to simulate a quantum coin toss.
10	Simulate the BB84 quantum key distribution protocol and generate a shared secret key

Text Books

Sr.No	Title	Author	Publisher	Edition	Year of Edition
1.	Quantum Computation and Quantum Information	Michael A. Nielsen and Isaac L. Chuang	Cambridge University Press.	10th	2010
2.	Quantum Computing for Everyone	Christopher Mims	MIT Press	1st	2019

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Text Books					
Sr.No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1.	Quantum Computing for Computer Scientists	Noson S. Yanofsky, Mirco A. Mannucci	Cambridge University Press	2nd	2023
2.	Quantum Computing: A Gentle Introduction	Eleanor G. Rieffel, Wolfgang H. Polak	MIT Press	2nd	2019

Online Resources:		
Sr. No	**Link**	**QR Code**
1	**https://onlinecourses.nptel.ac.in/noc19_cy31/preview**	
2	**https://www.classcentral.com/course/quantum-computing-university-of-british-columbia--120532**	
3	**https://www.udemy.com/course/quantum-computers/?kw=Quantum+Computing&src=sac&couponCode=PMNVD2025**	

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Course Contents:

Class	**B. Tech., Sem. VII**
Course Code and Course Title	**1ADPE407 AI in Healthcare**
Prerequisite/s	1ADPC204,1ADPC303
Teaching Scheme: (Lecture /Tutorial/ Practical)	2/0/2
Total Contact Hours:	26
Credits	3
Evaluation Scheme: ISE1/ MSE /ISE II/ ESE	40/30/30
Practical Evaluation Scheme: ISE	50

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1ADPE407_1	**Identify** the evolution and foundational concepts of AI in healthcare.
1ADPE407_2	**Examine** AI in Diagnosis and Treatment and Assistive Technology.
1ADPE407_3	**Analyze** the role of AI in medical imaging, predictive analytics, and personalized medicine for diagnosis and treatment
1ADPE407_4	**Evaluate** AI solutions for patient care, including remote monitoring, workflow Optimization, and drug discovery.
1ADPE407_5	**Examine** data management and security challenges in healthcare AI, focusing on Privacy, interoperability, and ethical considerations.
1ADPE407_6	**Assess** real-world AI case studies in healthcare, identifying challenges, limitations, and future innovations

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Introduction to AI in Healthcare** History and evolution of AI in healthcare, **Pioneering AI Projects in Healthcare,** Initial AI applications in medical diagnosis and treatment, Introduction to Artificial Intelligence in Medicine, Definition and scope of AI in healthcare, Historical perspective and milestones in AI research, Applications of AI in clinical practice and biomedical research	4 Hrs.

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Unit 2	**Artificial Intelligence in Healthcare sector & Assistive Technology** Limitations of available medical data,Natural Language Processing (NLP) in healthcare, Text mining and information extraction from clinical notes, AI in diagnosis of Genetic Diseases Cancer,Diabetes, AI in Diagnosis of Syndrome AI in diagnosis of Psychiatric Disorders,Depression	4 Hrs.
Unit 3	**AI in Diagnosis and Treatment** AI for medical imaging (radiology, pathology),Importance of Artificial Intelligence in Radiotherapy , Applications of AI in radiology, pathology, and ophthalmology Benefits of AI in Medical Imaging,Predictive analytics in diagnosis, AI-driven personalized medicine, Robotic surgery and AI-assisted procedure	5 Hrs.
Unit 4	**AI in Patient Care and Monitoring & operation** Remote patient monitoring systems, AI in chronic disease management, Wearable technology and health tracking, Virtual health assistants and chatboats, AI in healthcare administration and management, Optimization of hospital workflows, management. Predictive analytics for resource allocation, I in healthcare logistics and supply , Pharmacogenomics and precision medicine, Treatment recommendation systems, Drug discovery and repurposing using AI approaches	5 Hrs.
Unit 5	**Data Management and Security** Big data in healthcare, Interoperability and data integration, Standards and protocols for healthcare data,Ethical, Legal, and Social Implications (ELSI) of AI in Medicine, Bias and fairness in AI algorithms, Privacy and security of healthcare data, Regulation and policy considerations for AI in healthcare	4 Hrs.
Unit 6	**Case Studies and Applications** Successful AI implementations in healthcare, Challenges and limitations of AI in healthcare, Future trends and innovations in healthcare AI, real-world case studies. The Future Of Artificial Intelligence In The Health Sector	4 Hrs.

Experiment List	
1	Implement NLP techniques in healthcare, text mining and clinical language understanding, to extract meaningful insights from clinical data.
2	Implement AI algorithms for medical image analysis, focusing on tasks image classification and segmentation.
3	Implement predictive modelling techniques to develop an accurate and efficient disease diagnosis model using suitable machine learning algorithms and healthcare datasets.
4.	Implement Depression Detection Using Sentiment Analysis
5	Implement an ML algorithm for radiotherapy treatment planning.
6	Implement a predictive model for personalized treatment recommendations.
7	Analyze and Process large-scale healthcare datasets for personalized medicine
8	Real-World Case Study: Heart Disease Prediction
9	Implement Medical Imaging technique for Cancer Detection

10	Implement Micro project on AI in healthcare

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	AI in Health: A Leader's Guide to Winning in the New Age of Intelligent Health System	Tom Lawry	CRC Press/Taylor & Francis Group,	1st	2020
2	Artificial Intelligence in Healthcare: AI, Machine Learning, and Deep and Intelligent Medicine Simplified for Everyone	Dr Parag Suresh Mahajan	-	-	2022
3	A guide to artificial intelligence in healthcare. Budapest, Hungary: The Medical Futurist.	Dr.BertalanMeskó&NóraRadó	Copyright: The Medical Futurist	2nd	2019

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Artificial Intelligence for Health and Health Care	Dolores Derrington	JASON The MITRE Corporation	General Edition	2017

Online Resources:

Sr. No	Link	QR Code
1.	**https://www.coursera.org/specializations/ai-healthcare**	
2	**https://www.classcentral.com/course/coursera-generative-ai-for-healthcare-303594**	

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Course Details:

Class	B. Tech., Sem. VII
Course Code and Course Title	**1ADAI408- Machine Learning (Minor Course 4)**
Prerequisite/s	1ADAI305
Teaching Scheme: Lecture/Tutorial/Practical	3/0/0
Total Contact Hours:	39 Hours
Credits	03
Evaluation Scheme: ISE/ MSE /ESE	40/30/30

Course Outcomes (COs):	
Upon successful completion of the course, the students will be able to:	
1ADAI408_1	**Identify** the fundamental machine learning concepts and Python libraries for basic data analysis and visualization.
1ADAI408_2	**Analyze** supervised and unsupervised learning techniques using appropriate algorithms and tools.
1ADAI408_3	**Apply** advanced learning techniques to solve complex machine-learning problems
1ADAI408_4	**Use** recommendation systems and time series analysis techniques to provide data-driven insights and personalized solutions.
1ADAI408_5	**Apply** machine learning techniques to real-world applications and product recommendations

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Introduction to Machine Learning** Overview of Machine Learning, Why Machine Learning? Problems Machine Learning can solve, Types of Machine Learning: Supervised, Unsupervised, Semi-supervised, Reinforcement Learning, Python libraries & Tools- Jupyter Notebook, Colab , Numpy, Scipy ,mtplotlib ,pandas, Applications of Machine Learning	7 Hrs.
Unit 2	**Supervised Learning** Classification and Regression, Generalization, Overfitting, Under fitting Regression: Linear Regression, Logistic Regression, Classification: -k-Nearest Neighbors, Decision Trees, Random Forest model, Support Vector Machines.	6 Hrs.
Unit 3	**Unsupervised Learning** Types of Unsupervised learning, Challenges in Unsupervised learning, preprocessing& Scaling, different types of preprocessing, Dimensionality Reduction, Feature Extraction, Clustering-K-Means, Agglomerative Clustering	7 Hrs.

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Unit 4	**Advanced Learning** Reinforcement Learning, Representation Learning, Basic Neural Networks, Ensemble Learning, Bootstrap Aggregation, Boosting, Gradient Boosting	7 Hrs.
Unit 5	**Recommendation System and Time Series Analysis** Topic modeling Popularity-based recommender systems, Content-based recommendation systems, Classification-based recommendation systems, collaborative filtering, Correlation, Ranking systems.	6 Hrs.
Unit 6	**Applications of Machine Learning** Image Recognition, Speech Recognition, Email spam and Filtering, Online fraud detection, Medical Diagnosis, Product recommendations, Current Trends and Future Directions- Transfer Learning, AutoML	6 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Introduction to Machine Learning	EthemAlpaydin	Prentice Hall of India	3rd	2015
2	Master machine learning algorithms	JawsonBrowleen	Machine learning Master2016	-	2016
3	Introduction to Machine Learning	Prentice Hall of India,	-	3rd	2015
4	Machine Learning	Tom Mitchell	McGraw-Hill	-	2017

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Pattern Recognition and Machine Learning	Christopher M. Bishop	Springer Publications	-	2011
2	Artificial Intelligence: A Modem Approach	Stuart Jonathan Russell	Prentice Hall	3rd	2020
3	Machine Leaming Dummies	John Paul Muller, Luca Massaron	Wiley Publications	-	2021

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Online Resources:		
Sr. No	**Link**	**QR Code**
1.	https://nptel.ac.in/courses/106106139	
2.	https://www.coursera.org/learn/machine-learning-with-python	
3.	https://www.coursera.org/professional-certificates/ibm-machine-learning	

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Course Details:

Class	Final Year B. Tech, Sem. VII
Course Code & Course Title	**1ADPC409 Big Data Analytics**
Prerequisite/s	1ADPC210,1ADPC211
Teaching Scheme (Lecture /Tutorial/ Practical)	1/0/2
Total Contact Hours:	13 Hours
Credits	02
Practical Evaluation Scheme: ISE	50

Course Outcomes (COs) :	
Upon successful completion of the course, the students will be able to:	
1ADPC409 _1	**Classify** different types of Big Data.
1ADPC409 _2	**Describe** the physical organization of the Hadoop Distributed System..
1ADPC409 _3	**Develop** MapReduce tasks, including map and reduce operations
1ADPC409 _4	**Explore** the Big Data stack with a focus on virtualization in Big Data environments.
1ADPC409 _5	**Formulate** real-world Big Data problems using R-based tools and frameworks.

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Overview of Big Data** Introduction to Big Data, Evolution of Big Data, Structure of Big Data, Classification of Big Data, Characteristics of Big Data	02 Hrs.
Unit 2	**Big Data Analytics** Big Data Analytics, Big Data Analytics tools and Technology, Careers in Big Data, Future of Big Data, The big benefits of big data analytics,The big challenges of Big Data	02 Hrs.
Unit 3	**Understanding Hadoop Ecosystem** Hadoop Distributed System: Physical Organization of Compute Nodes, Large Scale File System Organization	02 Hrs.
Unit 4	**Map Reduce** The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of Map Reduce Execution, Coping with node failures, Hadoop YARN. The map reduce Framework, Techniques to Optimize Map Reduce Jobs Use of MapReduce,	02 Hrs.
Unit 5	**Understanding HBase** Introducing HBase, Hive, Pig and Pig Latin, Role of HBase in Big Data Processing, Exploring the Big data Stack, Virtualization and Big Data	02 Hrs.

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Unit 6	**BigData Analytics with R** Introduction to R and its relevance in Big Data Analytics, Connecting R with Hadoop (RHadoop), Connecting R with Spark (SparkR),Use Cases of R in Big Data Ecosystems, Big Data Libraries and Packages in R , Big Data Analytics with R.	03 Hrs.

Experiment List:	
1	Installation of Hadoop
2	Implement the following file management tasks in Hadoop: Adding files and directories, Retrieving files, Deleting files
3	Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm. Find the number of occurrence of each word appearing in the input file(s)
4	Hadoop Hive DDL commands, like create database, Viewing database, Dropping database
5	Hadoop Hive DML commands like Insert, delete, update, data retrieval queries
6	Write an R program to create a vector, add two vectors of integer type, and find sum, mean and product of a vector.
7	Working with R with data sets- create, read, write and R Tables- create, read, write.
8	Manipulating and processing data in R-merging datasets ,sorting data, putting data into shape
9	Demonstrates creating and interacting with Spark DataFrames in R.
10	Micro-project: students work in team on any application of Hadoop, and evaluate the model performance

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Big data Black Book	DT Editorial	Dreamtech Press Edition	1st	2016

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Hadoop : The Definitive Guide	Tom White	ODDLY Publication	3rd	2015
2.	Big Data and Analytics	5eema Acharya and SubhashiniChellappan	Wiley India	1st	2015
3.	Introductory statistics with R	Peter Dalgaard	Springer	2nd	2018

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Online Resources:		
Sr. No	**Link**	**QR Code**
1.	https://onlinecourses.nptel.ac.in/noc20_cs92/preview	
2.	https://qrco.de/bg8Q70	
3.	https://www.coursera.org/learn/big-data-technologies-and-applications	

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Course Details:

Class	B.Tech.,Sem- VII
Course Code and Course Name	**1ADEL410 Major Project/Project/Capstone Project**
Prerequisite	NIL
Teaching Scheme: Lecture/Tutorial/Practical	0/00/08
Credits	04
Evaluation Scheme : ISE/ESE	50/50

Course Outcomes(CO's):
After successful completion of this course, the student will be able to,

1ADEL410_1	**Define** and plan a major engineering project, considering feasibility, resources, and ethical implications.
1ADEL410_2	**Apply** fundamental engineering principles and relevant theories to solve complex engineering problems within the project scope.
1ADEL410_3	**Conduct** thorough research, analyze data effectively, and interpret results to inform project decisions and optimize solutions.
1ADEL410_4	**Develop** and implement a comprehensive project plan, including timelines, budgets, risk management strategies, and quality control measures.
1ADEL410_5	**Communicate** project goals, methodology, and outcomes effectively through written reports, presentations, and technical documentation.
1ADEL410_6	**Demonstrate** critical thinking, problem-solving, and design skills throughout all phases of the project, adapting to challenges and making informed decisions.
1ADEL410_7	**Gain** practical experience in working independently and collaboratively within a team environment, fostering effective communication and teamwork.

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General Guidelines:

1. **Project Scope:** The major project will involve the development and execution of a significant engineering undertaking. This may encompass a wide range of activities, including:
   - **Design Projects:** Creating novel solutions to engineering problems, such as designing new devices, systems, or processes.
   - **Experimental Studies: Conducting** research through experimentation, collecting and analyzing data, and drawing conclusions.
   - **Computer Simulations:** Utilizing computational models and simulations to investigate and analyze engineering phenomena.

   All projects must focus on topics relevant to the specific Department's specialization, ensuring a strong connection to the core curriculum and industry practices.

2. **Project Components:** The successful completion of the major project necessitates the integration of several critical components:
   - **Problem Identification &Definition:** Clearly identifying and defining an engineering problem or challenge within the project scope.
   - **Literature Review:** Conducting thorough research on existing knowledge, methodologies, and best practices related to the project.
   - **Problem Formulation:** Translating the identified problem into a well-defined set of engineering objectives and constraints.
   - **Design & Development:** Designing, developing, and implementing solutions, which may include:
     - Conceptual design and ideation
     - Detailed design and prototyping
     - System integration and testing
   - **Utilization of Modern Tools & Techniques:** Employing relevant and contemporary engineering tools and techniques throughout the project, such as:
     - AI and Machine Learning Tools
     - Simulation and analysis software
     - Data acquisition and analysis tools
     - Project management software

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3. **Project Synopsis Submission**: Students are required to submit a project synopsis outlining the proposed major project. This synopsis must include the following:
    - **Project Scope:** A clear and concise description of the project, including its objectives,

      Boundaries , and relevance to the chosen area of specialization.
    - **Project Objectives:** Specific, measurable, achievable, relevant, and time-bound(SMART) objectives that the project aims to achieve.
    - **Methodology:** A detailed description of the project approach, including:
        - Research methodology(e.g.,literature review, experimental design, simulation methods)
        - Design and development process (if applicable)

Data collection and analysis methods

- **Resources &Tools:** A list of anticipated resources, including:
    - Software
    - Equipment and materials
    - Access to facilities (e.g., laboratories, workshops)
- **Expected Results:** A clear statement of the anticipated outcomes of the project, including:
- Measurable results (e.g., performance data, design specifications, research findings)
    - Potential impact and contributions
- **Project Time line:** A realistic and detailed project schedule, including key milestones and deadlines for completion. The project synopsis submission serves as a crucial step in the project planning process, ensuring that students have a well-defined plan before commencing their work.

4. **Project Duration**: The project work is structured to be completed over four semesters (6 - 7),with the same group continuing to work under the guidance of the assigned project guide throughout this period.

5. **Group Formation**: Students will typically work in groups of 2 to 4 members to complete the major project. The maximum group size is strictly limited to 4 members.

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6. Assessment

- **Project Synopsis & Progress Presentations:** The project synopsis and progress presentations will be evaluated using established rubrics.
- **Project Diary & Report** - The project diary, meticulously maintained throughout the project duration, will be a crucial component of the overall assessment. The final project report will be assessed during the End-Semester Examination (ESE).
- **Project Presentations** - Students will make three presentations before the project evaluation committee. These presentations will be collectively assessed.

In Semester Evaluation	
Particulars	**Marks**
Synopsys Presentation	10
Progress Presentation-I	10
Progress Presentation-II	15
Progress Presentation-III	15
End Semester Examinations	
Project Work Report	25
Viva-Voce Examination	25

7. Submission Requirements

➔ **Project Work Diary**

- **Maintenance:** Meticulously maintained by the group throughout the project duration.
- **Entries:** Reflects daily or weekly efforts, including project selection, literature review, experimental work, data analysis, and any other relevant activities.
- **Counter signature**: Weekly counter signed by the assigned project guide.

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➔ **Project Synopsis:**

★Format: Submitted in the prescribed format, including:

- Project Title
- Student Names &URN Numbers
- Guide's Name &Department
- Project Relevance &Significance
- Comprehensive Literature Review(minimum 10peer-reviewed journal articles)
- Proposed Work: Objectives, Methodology, and approach
- Expected Outcomes
- Detailed Budget Estimate
- References (in the specified format)

★Approval:

- Signed by each group member.
- Approved by the project guide.
- Endorsed by the Head of the Department.

➔ **Project Report:**

★Format:

- Typedreportofminimum50andmaximum100pages.
- Adheres to the standardized format for page size, margins, font, and spacing
- References: All references (journal articles, books) must be cited correctly in the specified format.

➔ **Project Presentations:**

- **Presentations:** Students must present their project progress to faculty members and review panel members during scheduled reviews.
- **Submission:** Soft copies of all presentation slides (PowerPoint/PPT) must be submitted to the project guide.

➔ **Project documentation:**

The Project Coordinator shall maintain a separate file with following documents

- Approved Project Synopsis
- Project Review Schedule
- Soft Copies of all presentation slides in Google Drive
- Assessment marks for each review, along with the corresponding rubrics.

Course Details:

Class	B. Tech, Sem. VIII
Course Code &Course Title	**1ADPE411 Introduction to Large Language Models (LLM)**
Prerequisite/s	1ADPC314
Teaching Scheme (Lecture/Practical/Tutorial)	3/0/0
Total Contact Hours:	39 Hours
Credits	03
Theory Evaluation Scheme: ISE/ MSE /ESE	40/30/30

Course Outcomes (COs) : Upon successful completion of the course, the students will be able to:	
1ADPE411_1	**Understand** foundational concepts of NLP and Deep Learning
1ADPE411_2	**Develop** Statistical Language Models and Neural network-based language models for their effectiveness in NLP tasks
1ADPE411_3	**Implement** sequence models and attention mechanisms
1ADPE411_4	**Develop** advanced NLP models, such as Transformers, using transfer learning and modern prompting techniques.
1ADPE411_5	**Analyze** alignment, adaptation techniques, and knowledge graphs
1ADPE411_6	**Implement** retrieval-augmented techniques for open-book question answering and knowledge graph tasks in NLP

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Foundations of NLP and Deep Learning** **Introduction to NLP:** NLP pipeline, applications of NLP, Distributional semantics, **Introduction to Deep Learning:** Perceptron, ANN, Back propagation, Introduction to CNN, **Word Vectors:** Word2Vec, Gove, fastText.	07 Hrs.

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Unit 2	**Statistical Language Models and Neural Networks** **Statistical Language Models:** N-gram Language Models, Perplexity and Smoothing Techniques, **Neural Language Models:** CNN and RNN-based Language Models, **Introduction to PyTorch:** Basics of PyTorch, Implementation of RNNs and LSTMs using PyTorch.	06 Hrs.
Unit 3	**Sequence Models and Attention Mechanisms** **Sequence-to-sequence Models:** Encoder-decoder architecture, Beam Search, **Attention Mechanisms:** Attention and self-attention mechanisms, **Transformers:** Introduction to Transformers, Positional Embedding and tokenization strategies, Implementation of Transformers using PyTorch.	07 Hrs.
Unit 4	**Transfer Learning and Advanced Prompting** **Transfer Learning:** ELMo and BERT (Encoder-only models), GPT (Decoder-only models) and T5 (Encoder-decoder models), **Prompting Techniques:** Hard and soft prompting, Instruction fine-tuning (FLAN), Advanced prompting techniques (Chain of Thoughts, Graph of Thoughts, Prompt Chaining), **Introduction to HuggingFace Library:** Basics and implementation.	07 Hrs.
Unit 5	**Alignment, Adaptation, and Knowledge Graphs** **Alignment with Human Feedback:** RLHF (Reinforcement Learning with Human Feedback), RLAIF (Reinforcement Learning with AI Feedback), **Parameter-Efficient Adaptation:** Prompt Tuning, Prefix Tuning, LoRA (Low-Rank Adaptation), **Knowledge Graphs:** Representation and Completion, Tasks: Alignment and Isomorphism, Graph Neural Networks vs. Neural KG Inference.	06 Hrs.
Unit 6	**Retrieval, Recent Models, and Ethical NLP** **Open-book Question Answering and Retrieval Augmentation:** Retrieving from structured and unstructured sources, Techniques: Key-value memory networks, REALM, RAG, FiD, Unlimiformer, Knowledge Graph Question Answering (EmbedKGQA, GrailQA), **Overview of Recent Models:** GPT-4, Llama 3, Claude 3, Mistral, and Gemini, **Ethical NLP:** Addressing Bias and Toxicity in NLP, Concluding Discussions	06 Hrs.

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Text Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
01	Speech and Language Processing	Daniel Jurafsky and James H. Martin	Pearson	3	2023
02	Deep Learning for Natural Language Processing	Palash Goyal, Sumit Pandey, and Karan Jain	Apress	1	2018
03	Natural Language Processing with PyTorch	Delip Rao and Brian McMahan	O'Reilly	1	2019

Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
01	Transformers for Natural Language Processing	Denis Rothman	Packt Publishing	2nd	2022
02	Introduction to Information Retrieval	Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze	Cambridge University Press	1	2008
03	Programming PyTorch for Deep Learning	Ian Pointer	O'Reilly Media	1	2019
04	Ethics of Artificial Intelligence	Ethics of Artificial Intelligence	Oxford University Press	1	2020

Online Resources:		
Sr. No	**Link**	**QR Code**
1.	**https://onlinecourses.nptel.ac.in/noc25_cs161**	
2.	**https://www.coursera.org/learn/introduction-to-large-language-models**	

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Course Details:

Class	B. Tech, Sem. VIII
Course Code & Course Title	**1ADPE412 Programming in Java**
Prerequisite/s	1ADPC202
Teaching Scheme (Lecture Practical/Tutorial)	3/0/0
Total Contact Hours:	39 Hours
Credits	03
Theory Evaluation Scheme: ISE/MSE/ESE	40/30/30

Course Outcomes (COs):	
Upon successful completion of the course, the students will be able to:	
1ADPE412_1	**Understand** the fundamental concepts of Object-Oriented Programming (OOP) and Java programming language syntax and structure.
1ADPE412_2	**Apply** Java programming elements (data types, operators, and control structures, methods) to develop functional programs.
1ADPE412_3	**Demonstrate** proficiency in handling input/output operations in Java and managing file I/O efficiently.
1ADPE412_4	**Implement** encapsulation and inheritance in Java for better code organization and reusability.
1ADPE412_5	**Create** robust applications by implementing exception handling and multithreading to ensure reliability and performance.
1ADPE412_6	**D**evelop Java-based applications using GUI frameworks (Swing, AWT), networking, and JDBC to build real-world systems.

Course Contents:

Unit No.	**Unit Name**	**Contact Hours**
Unit 1	**Java Fundamentals** Introduction to Java, Java Programming Environment Setup, Java Tools and Resources, Data Types and Variables, Operators, Control Flow Statements (if-else, loops)	07 Hrs.

Unit 2	**Object-Oriented Programming** Classes and Objects Encapsulation, Inheritance, Polymorphism, Abstraction, Method Overloading and Overriding	06 Hrs.
Unit 3	**Exception Handling & Multithreading** Exception Handling (try-catch-finally, throw, throws) Multithreading (Thread class, Runnable interface)	06 Hrs.
Unit 4	**Input/output& Applets** Input/output Streams (I/O Streams),File Handling, Applet Programming	07 Hrs.
Unit 5	**GUI Programming** AWT (Abstract Window Toolkit),Swing Components, Event Handling	06 Hrs.
Unit 6	**Advanced Java & Database** Java Networking, JDBC (Java Database Connectivity), Sorting and Searching Algorithms, Advanced Java Concepts	07 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Object-Oriented Programming with C++ and Java	Debasis Samanta	Prentice Hall India	-	-

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Java: The Complete Reference	Hebert Schildt	Mc Graw Hill	-	-

Online Resources:

Sr. No	*Link*	*QR Code*
1.	***https://onlinecourses.nptel.ac.in/noc25_cs110/***	

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Course Details:

Class	B. Tech, Sem. VIII
Course Code &Course Title	**1ADPE413 Blockchain and its Applications**
Prerequisite/s	-
Teaching Scheme (Lecture Practical/Tutorial)	3/0/0
Total Contact Hours:	39 Hours
Credits	03
Theory Evaluation Scheme: ISE/MSE/ESE	40/30/30

Course Outcomes (COs) : Upon successful completion of the course, the students will be able to:	
1ADPE413_1	**Understand** block chain fundamentals, including cryptographic hash and digital signature concepts.
1ADPE413_2	**Compare** the differences between permissionless and permissioned blockchain consensus models.
1ADPE413_3	**Deploy** smart contracts on Ethereum and Hyperledger Fabric.
1ADPE413_4	**Apply** blockchain solutions for decentralized identity management and interoperability.
1ADPE413_5	**Design** blockchain-based applications for real-world use cases.

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Introduction to Blockchain and Cryptography Basics** Introduction to Blockchain Technology and its Importance, Basic Crypto Primitives I – Cryptographic Hash, Basic Crypto Primitives II – Digital Signature	07 Hrs.
Unit 2	**Blockchain Evolution and Architecture** Evolution of the Blockchain Technology, Elements of a Blockchain	06 Hrs.

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Unit 3	**Blockchain Consensus Mechanisms** Blockchain Consensus I – Permissionless Models, Blockchain Consensus II – Permissioned Models	06 Hrs.
Unit 4	**Smart Contracts and Permissioned Blockchains** Smart Contract Hands On I – Ethereum Smart Contracts (Permissionless Model), Smart Contract Hands On II – Hyperledger Fabric (Permissioned Model)	07 Hrs.
Unit 5	**Advanced Blockchain Topics** Decentralized Identity Management, Blockchain Interoperability	07 Hrs.
Unit 6	**Blockchain Applications and Future Trends** A potential usecases from critics perspective, Blockchain in financial services, public sector usecases, Blockchain for decentralized marketplace	06 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more	Imran Bashir	-	3rd	2020

Online Resources:

Sr. No	*Link*	*QR Code*
1.	***https://onlinecourses.nptel.ac.in/noc22_cs44***	

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Course Details:

Class	B. Tech, Sem. VIII
Course Code &Course Title	**1ADPE414** Augmented Reality and Virtual Reality
Prerequisite/s	-
Teaching Scheme (Lecture Practical/Tutorial)	3/0/0
Total Contact Hours:	39 Hours
Credits	03
Theory Evaluation Scheme: ISE/MSE/ESE	40/30/30

Course Outcomes (COs):

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

1ADPE414_1	**Describe** how AR-VR systems work and list the applications of AR-VR.
1ADPE414_2	**Demonstrate** hardware and software components used in augmented reality and virtual reality to perform experiments by identifying specific requirements of application
1ADPE414_3	**Use** unity game engine and ARCore framework to perform specific experiments using augmented reality and virtual reality
1ADPE414_4	**Design** augmented reality applications to solve given problem using unity game engine and vuforia software
1ADPE414_5	**Design** and **Build** a virtual reality applications to solve given problem using unity game engine, vuforia software and virtual reality boxes

Course Contents:

Unit No.	Unit Name	Contact Hours
Unit 1	**Understanding Augmented & Virtual Reality (AR-VR)** Overview of AR and VR: History, evolution, and significance. key differences. Devices & Platforms: VR headsets (Oculus, HTC Vive). AR devices (HoloLens, mobile AR) Hardware Components: Sensors, displays, controllers, haptics, motion tracking. Software Platforms: Unity3D, Unreal Engine, WebXR, ARKit, ARCore.	07 Hrs.

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Unit 2	**Fundamentals of the Unity Game Engine** Unity Basic Concepts, Installation of Unity, Overview of the Unity Game Engine: Editor Camera Controls, Creating Geometry, Setting Up The Scene Camera	06 Hrs.
Unit 3	**Unity Game Engine Objects and Components** Import External Objects, Game Objects, Scene graph, Components, Assets, Shading and Materials, Importing & Using Textures, Lighting, Scripting in Unity, Fundamental Classes: MonoBehavior, GameObject, Transform.	06 Hrs.
Unit 4	**AR Development :** AR Platforms: Introduction to ARCore, ARKit, Marker-based vs. Markerless AR: Concepts and implementation. Object Tracking & Detection: Understanding object recognition. Building an AR Application: Creating an interactive mobile AR experience.	07 Hrs.
Unit 5	**VR Development:** VR World Building: Scene creation, object placement, and navigation in VR Interaction in VR: Physics, gravity, & movement within a virtual environment Building VR Application: End-to-end development of a basic VR application.	07 Hrs.
Unit 6	**Industry applications & Future Trends in AR and VR** Applications of AR/VR: Gaming, education, healthcare, engineering, real estate, entertainment etc. Next-Gen AR/VR Devices: Wearables, contact lenses, and future HMDs Artificial Intelligence in AR/VR: AI-driven interaction and world-building Augmenting Reality with IoT: Integrating AR/VR with IoT devices and smart environments.	06 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1.	Augmented Reality: Principles and Practice	Dieter Schmalstieg, Tobias Hollerer	AddisonWesley	First Edition	2016
2.	The VR Book: HumanCentered Design for Virtual Reality (ACM Books)	Jason Jerald	Morgan & Claypool	Illustrated edition	2015

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Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
1.	Hands-On Augmented Reality Development with Meta Spark Studio	Afshar, Jaleh	Berkeley, CA : Apress	First edition	2023
2.	Advances in augmented reality and virtual reality	Jitendra Kumar Verma, Sudip Paul,	Springer	First edition	2022

Online Resources:		
Sr. No	Link	QR Code
1.	https://nptel.ac.in/courses/121106013	
2.	http://cambum.net/course-2.htm	

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Course Details:

Class	Final Year B. Tech, Sem. VIII
Course Code & Course Title	**1ADEL416, Internship**
Prerequisite/s	1ADEL310
Teaching Scheme (Lecture /Tutorial/ Practical)	00/00/00
Credits	10
Practical Evaluation Scheme: ISE	100

Course Outcomes (COs):

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

1ADEL416 _1	**Utilize** engineering concepts to engage in real-world projects within a professional environment
1ADEL416 _2	**Operate** industry-specific tools, software, and equipment efficiently.
1ADEL416 _3	**Exhibit** strong teamwork skills by working alongside industry professionals, peers, and mentors to successfully meet project goals, ensuring compliance with industry regulations and standards
1ADEL416 _4	**Analyse challenges** encountered in industrial processes, proposing innovative and effective solutions.
1ADEL416_5	**Create** comprehensive reports, including case studies, and deliver impactful presentations that effectively convey insights and outcomes from projects and learning experiences.

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Internship Requirements:

All students are required to complete an internship at a research organization, university, or industry to gain practical exposure through meaningful projects that align with their academic learning. This internship must be approved by the Head of the Institution and has a duration of a minimum of 12 weeks and a maximum of 24weeks, as specified in the curriculum.

The tables below represent the outline of the internship guidelines and student responsibilities: For detailed guidelines and procedures, refer to the Institute Internship Policy Document.

1. Request Letter	Obtain a request letter from the institute, signed by the Institute Director, addressed to the HR manager or relevant authority.
2. Confirmation Letter	Submit the confirmation letter from the industry or organization to the Internship Coordinator and Department Office.
3. Mentorship	A faculty member will act as a mentor for a group of students to monitor, evaluate, and guide their internship activities. The mentor will visit the internship location at least once or twice during the internship period and provide feedback to the Internship Coordinator.
4. Progress Reports	Submit progress reports every two weeks to the mentor, along with a final report to the Internship Coordinator.
5. Evaluation	The mentor and an assessment panel will evaluate student performance post-internship, submitting an evaluation report to the Department Office.
6. Internship Certificate	Obtain and submit an Internship Certificate from the organization to the Internship Coordinator.
8. Presentation and Term Work	Deliver a presentation on internship work as part of term assessments; submit an internship diary and report for evaluation.

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Student Responsibilities:

Category	Responsibilities
Professionalism	Adherence to workplace rules, ethical conduct, professional communication
Engineering Skills	Apply engineering fundamentals, use tools and software, conduct experiments, solve problems
Industry Knowledge	Learn industry standards, observe practices, understand project management
Professional Development	Improve communication, teamwork, problem-solving, time management, build network, enhance employability
Learning & Growth	Seek learning opportunities, apply classroom knowledge, maintain a journal, gain insights into career paths

Internship Guidelines: Internship Evaluation Process

The Internship of students will be assessed in three key stages:

1. **Evaluation by Industry**

ØPunctuality

ØWillingness to learn

ØDaily diary maintain

ØSkill test performance

ØSupervisor's remarks

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Evaluation by Faculty Mentor on Student performance and Internship Report

ØFaculty Mentor will evaluate students based on their attendance, participation, and engagement during the internship.

ØThe quality and completeness of the internship report will also be assessed.

3. **Seminar Presentation/Viva-Voce at the Institute**

·Students will present a seminar based on their internship report before an expert committee formed by the relevant department, in accordance with institute norms.

·The evaluation criteria for the seminar presentation will include:

·Quality of content presented

·Planning and organization of the presentation

·Effectiveness of delivery

·Depth of knowledge and skills demonstrated

·Attendance record, daily diary entries, and departmental reports will also be reviewed alongside the internship report.

This seminar presentation serves as an opportunity for students to share their knowledge and experiences with peers and faculty, enhancing their communication skills and building confidence.

Final Evaluation During the final evaluation, the student shall prepare and submit a report and give a presentation before his/her Department Committee at the college.

In-Semester Evaluation

Criteria	Evaluated By	Weightage (%)	Description
Student Performance	Industry Supervisor	25%	Evaluated based on a rubric and feedback form, focusing on punctuality, eagerness to learn, skill tests, and professionalism
Submission of Internship Report with Certificate	Institute	20%	Assesses the quality, structure, and content of the report submitted by the student, reviewed by the mentor, along with the internship certificate.

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Internship Diary, Attendance Record, and Industry-Faculty Interaction	Institute (During and End of Internship)	15%	Evaluates consistency and detail in maintaining the diary, adherence to attendance, and meaningful engagement during interactions with mentors.
Presentation, Demonstration, or Case Studies	Institute	30%	Assesses the student's ability to effectively communicate insights, demonstrate practical learning outcomes, or analyze and present case studies..
Viva-Voce	Institute	10%	Tests the student's depth of understanding, analytical skills, and ability to articulate their internship experience during an oral evaluation.

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