D Y Patil College of Engineering, Akurdi, Pune An Autonomous Institute from AY 2024-25 affiliated to Savitribai Phule Pune University



Curriculum Structure and Syllabus of

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE



National Education Policy (NEP) based Curriculum

R7: 27 March 2025



Preface

D Y Patil College of Engineering, Akurdi, Pune (DYPCOE) has been recognized for providing quality education in Maharashtra for the past 40 years. With a commitment to academic excellence and a vision for the future, DYPCOE is now boarding a new journey towards Autonomy, in line with the latest educational reforms. The Institute is dedicated to the effective implementation of the New Education Policy (NEP) 2020, as per the guidelines by the Government of Maharashtra. This initiative is aimed at fostering the holistic development of our students, ensuring they are well-equipped to meet the challenges of the 21st century.

The present syllabus details the second-year engineering (SY) syllabus, meticulously designed to align with the NEP 2020 and effective from the academic year 2024-25. The curriculum is structured to provide a robust foundation through Basic Science Courses and Engineering Science Courses. It also integrates Vocational and Skill Enhancement Courses, Ability Enhancement Courses, the Indian Knowledge System, and co-curricular Liberal Learning courses. This comprehensive approach aims to cultivate well-rounded engineers who are adaptable to Internationalization.

One of the key highlights of this syllabus is its emphasis on Experiential Learning and handson experience. By integrating theoretical knowledge with practical laboratory sessions, we aim to enhance the learning process and foster a deeper understanding of core concepts. Additionally, the curriculum promotes research and innovation by encouraging students to engage in project-based learning.

The development of this curriculum has been a collaborative effort, and we owe a debt of gratitude to all those who have contributed to its creation. Our sincere thanks go to the Management, Steering Committee Members, Heads of Departments, and the Board of Studies chairpersons and members for their invaluable input and dedication. Their collective expertise and commitment have been instrumental in shaping this curriculum.

We are confident that this new curriculum will pave the way for our students to achieve academic excellence and holistic development, preparing them to thrive in an ever-evolving global landscape.

Dr. Mrs. P. Malathi Principal



An Autonomous Institute from AY 2024-25, Affiliated to Savitribai Phule Pune University, Pune

Programs Offered in Bachelor of Technology (B Tech)

- 1. Artificial Intelligence and Data Science
- 2. Civil Engineering
- 3. Computer Engineering
- 4. Electronics and Telecommunication Engineering
- 5. Information Technology
- 6. Instrumentation and Control Engineering
- 7. Mechanical Engineering
- 8. Robotics and Automation

Abbreviations and Definitions

NEP: National Education Policy **PEO**: Program Educational Objectives **PO**: Program Outcomes **PSO:** Program Specific Outcomes **CO**: Course Outcomes **BSC**: Basic Science Courses **ESC**: Engineering Science Courses **VSEC**: Vocational and Skill Enhancement Courses EEM:Entrepreneurship/Economics and Management **OE:**Open Elective **MDM:**Multidisciplinary Minor **VEC:**Value Education Course NC:Non Credit **FP:Field Project AEC**: Ability Enhancement Courses **CC**: Co-Curricular Courses IKS: Indian Knowledge System **HSSM**: Humanities Social Science and Management PCC: Program Core Course CCA: Continuous Comprehensive Assessment ESE: End Sem Examination Cr: Credits L: Lecture T: Tutorial \mathbf{P} · Practical FY: First Year SY: Second Year TY: Third Year BY: Final Year Group A: Computer, IT and AIDS

Group B: ETC, Instrumentation and Robotics and Automation, **Group C**: Civil and Mechanical

Group I: Civil, Mech, Robotics and Automation, Instrumentation **Group II**: Computer, IT, AIDS, ETC,

Cycle I: Computer, IT and AIDS Cycle II: Civil, Mech, Robotics and Automation, ETC, Instrumentation



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Detailed Syllabus

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Second Year l	Engineerir	ng SY B Tech Sei	meste	r III			-						
			Т	eaching	g Schen	ne		F	valuatio	on Sch	eme		
	Course							Theory Marks			Practical Marks		
Course Code	Туре	Course	L (Hr)	T (Hr)	P (Hr)	Cr	Exa m	Max %	Min Marks for Passing		Max %	Min Marks for Passing	
AD124PC301	PCC2	Fundamentals					CCE	50	20	10			
		Structure	3	0	0	3	ESE	50	20	40			
AD124PC302	PCC2	Fundamentals of	0	0	2	1	CCE				50	20	40
		Data Structure	0	0	2	1	ESE				50	20	40
AD124PC303	PCC3						CCE	50	20				
		Statistical Motheda	3	0	0	3	ESE	50	20	40			
AD124PC304 PCC4		Software					CCE	50	20				
		Engineering	3	0	0	3	ESE	50	20	40			
AD124MD305 MDM1	MDM1	Fundamentals of					CCE	50	20				
		AI	2	0	0	2	ESE	50	20	40			
AD124OE306	OE1	Critical Thinking and Problem Solving	-				CCE	50	20				
			3	1	0	4	ESE	50	20	40			
AD124EE307	EEM1	Project		0			CCE	50	20	40			
		Management	2		0	2	ESE	50	20	40			
AD124VE308	VEC1	Sustainable Development I	2	0	0	2	CCE	50	20	<u> </u>			
AD124FP309	FP	Mini Project	0	0	4	2	CCE	100	40				
AD124NC310	NC1	Design Thinking	1	0	2	0	CCE	50	20				
AD124NC311	NC2	Professional and Technical Communication	0	0	2	0	CCE	50	20				
		Total Credits	19	1	10	22							
					Hrs								
			Theo	ry	20								
			Prace	t/Lab	10								
			Total	l	30								



Second Year En	gineering S	Y B Tech Semester	IV										
]	Feachin	g Sch	eme		E	valua	tion S	chem	e	
Course	Course	Course	L	T	P	Cr	F	Theory Marks			Practic al Marks		
Code	Type		(пг))(H r)	(Hr)		Exam	Max %	Mi Ma for Pa	n arks ssing	Ma x %	Min Marks for Passin g	
AD124PC401	PCC5	Data Structure and					CCE	50	20				
		Algorithm	3	0	0	3	ESE	50	20	40			
AD124PC402	PCC5	Data Structure & Algorithm Lab	0	0	2 1 CCE					50	20		
							ESE				50	20	40
AD124PC403	PCC6	Artificial	3	0	0	3	CCE	50	20				
		Intelligence					ESE	50	20	40			
AD124PC404	PCC6						CCE	50	20		50	20	
		Artificial Intelligence Lab	0	0	2	1	ESE	50	20	40	50	20	40
AD124PC405	PCC7	Computer					CCE	50	20				
		Organization & Operating System	2	0	0	2	ESE	50	20	40			
AD124MD406	MDM2	Data Science	2	0	0	2	CCE	50	20				
							ESE	50	20	40			
AD124OE407	OE2	Personal &					CCE	50	20				
		Workspace productivity	2	0	0	2	ESE	50	20	40			
AD124VS408	VSEC3	Advanced Excel	1	0	2	2	CCE	100		40			
AD124AE409	AEC2	Professional Skill Development	1	0	2	2	CCE	100	40				
AD124EE410	EEM2	Project					CCE	50	20				
		Finance And	2	0	0	2	ESE	50	20	40			
AD124VE411	VEC2	Sustainable Development II	2	0	0	2	CCE	50	20				
AD124NC412	NC3	MOOCS	0	0	2	0	CCE	50	20				
AD124NC413	NC4	Professional and Technical	0	0	2	0	CCE	50	20				
		Total Credits	18	0	12	22							
					Hrs								
			Th	eory	18								
			Pra	act/Lab	12								
			Tot	tal	30								



B Tech in AI & DS Engineering | S Y B Tech Semester III (2024 COURSE)

Course C	ategory			Program	Core Cou	irse	Course	AD124PC301			
				2	2						
Course T	itle	-		Fundame	Fundamentals of Data Structure						
Teaching Schen				ne	Evaluat	ion Sch	eme				
т					Theory % Marks						
L	1	r	Cr	Exam	Max	Min fo	or Pass				
3	-	-	3	ССЕ	50	20	40				
Total Hours:39			ESE	50	20	40					

Prerequisites: Programming and Problem Solving						
Course Objective: After successful completion of the course the student will be able to:						
1. Acquaint with the structural constraints and advantages in usage of the data						
2. Gain proficiency in implementing various types of arrays						
3. Develop the understanding of different searching and sorting algorithms						
4. Learn to implement and utilize advanced data structures like Linked List, stacks and	queues					
Course Outcomes: After successful completion of the course the student will						
CO1 Comprehend and Analyze the fundamental concepts of data structures and	BTL2					
Algorithm designing Techniques						
CO2 Apply and implement the array-based structures for matrices and Polynomials	BTL3					
CO3 Implement the searching and sorting algorithms	BTL3					
CO4 Analyze and Demonstrate the concepts of dynamic memory allocation using	BTL4					
Linked List and its operation and applications						
CO5 Analyze and Implement principles of data structures-stack and queue to solve	BTL4					
computational problems						

Syllabus								
Unit I	Introduction to Data Structures and Algorithm8 Hrs							
Data Stru design, imp	etures: Data, Information, Knowledge, and Data structure, Introduction to ab plementation and applications.	stract data types,						
Algorithm tools: Pseud	s : Problem Solving, Introduction to algorithm, Characteristics of algorithm, A docode and flowchart	Algorithm design						
Algorithm Algorithm	analysis : Time and space complexity - Asymptotic Notations and its propertied design techniques: Divide and Conquer methodology Dynamic program	es. amming Greedy						
Technique	usign teeninquest bittue une conquer menouology, bynamie progre	uning, Greedy						
Case	SmartFlow tool for visualization of Algorithms							
Studies	Evaluating Asymptotic Behavior of Search Algorithms							
Unit II	Arrays and Strings	8 Hrs						



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Representation of Arrays in Memory: one dimensional, two dimensional and Multidimensional, accessing of elements of array, performing operations like Insertion, Deletion and searching **Demonstration of representation of Polynomials**: Representation using arrays, Polynomial as array of structure, Polynomial addition, and multiplication. Sparse Matrices with arrays: Sparse matrix representation using array. Sparse matrix addition. Transpose - Simple and Fast Transpose Case Flight Booking System (a sparse matrix to represent flight schedules and perform fast transpose to analyze booking patterns) Studies Global temperature modeling (Processing of multidimensional data representing temperature variations across Geographic locations (latitude and longitude) Unit III **Searching and Sorting** 7 Hrs Searching: Linear Search, Sentinel Search, Binary Search, Interpolation Search, and Indexed Sequential Search Sorting: Insertion Sort, Quick sort, Merge sort, Bubble sort, Selection sort, Shell sort, Heap sort, Radix Sort Web search engines, like Google and Bing (Web search engines typically use Binary Search Case to find specific documents within an already sorted set of indexes) Studies Order Matching in Stock Exchanges (Quick Sort or Merge Sort algorithms help organize orders by price and time to quickly find the most optimal match) Unit IV Linked List 8 Hrs Singly linked list: Representation of singly linked list, Operations of singly Linked list such as Traversing, Insertion and Deletion, Searching, Applications of Linked List. **Circular linked list and doubly linked list:** Introduction, their operations and Applications Polynomials: Polynomial Representation using Linked List, Generalized Linked List (GLL) concept, Representation of Polynomial using GLL Task Scheduling in Operating Systems (Use of circular linked lists for implementing Case round-robin scheduling in operating systems Studies Browser Navigation System (Doubly linked lists for implementing forward and backward navigation in web browsers) Unit V Stack and Queue 8 Hrs Stacks: Stacks as ADT, implementation Operations of stack, multiple stacks. Application of Stack: Conversion of infix to postfix notation using stack, Parsing expressions (XML/HTML documents, Checks proper nesting in structured document), evaluation of postfix expression. **Recursion**- Introduction, types of recursions- direct, indirect and applications of Recursion **Queues**: Queues as ADT, Different implementation of queue **Circular queue-** Concept and Its Operation Doubly ended Queues (D-queue)-Concepts and its operations and Priority Queue: Introductions Operations and its applications A Stack-Based Undo and Redo Mechanism in Text Editor Case Studies **Tower of Hanoi using Stack**



Text Books:

- 1. Horowitz, Sahani, Dinesh Mehata, "Fundamentals of Data Structures in C++" , Galgotia Publisher, ISBN: 8175152788, 9788175152786.
- 2. Brassard & Bratley, "Fundamentals of Algorithms", Prentice Hall India/Pearson Education, ISBN 13-9788120311312.

Reference Books:

- 1. Steven S S. Skiena, "The Algorithm Design Manual", Springer, 2nd ed. 2008 Edition, ISBN-13: 978-1849967204, ISBN-10: 1849967202.
- 2. Allen Downey, Jeffery Elkner, Chris Meyers, "How to think like a Computer Scientist: Learning with Python", Dreamtech Press, ISBN: 9789351198147.
- 3. M. Weiss, "Data Structures and Algorithm Analysis in C++", 2nd edition, Pearson Education, 2002, ISBN-81-7808-670-0.
- 4. Brassard and Bratley, "Fundamentals of Algorithmic", Prentice Hall India/Pearson Education, ISBN 13-9788120311312.
- 5. Yashwant Kanetkar & A. Kanetkar, "Let us Python", BPB Publisher, ISBN: 9789389845006

Journal Papers:

 B. Park and D. T. Ahmed, "Abstracting Learning Methods for Stack and Queue Data Structures in Video Games," 2017 International Conference on Computational Science and Computational Intelligence (CSCI), Las Vegas, NV, USA, 2017, pp. 1051-1054, doi: 10.1109/CSCI.2017.183.

V Lab:

- 1. Quick Sort Experiment, https://ds1-iiith.vlabs.ac.in/exp/quick-sort/index.html
- 2. Stacks and Queues, <u>https://ds1-iiith.vlabs.ac.in/exp/stacks-queues/index.html</u>
- 3. Linked List, https://ds1-iiith.vlabs.ac.in/exp/linked-list/index.html
- 4. Polynomial Arithmetic, https://ds1-iiith.vlabs.ac.in/exp/poly-arithmetic/index.html

MOOCSs:

- 1. https://nptel.ac.in/courses/106/102/106102064/ (Introduction to Data Structures and Algorithms, IIT Delhi , Prof. Naveen Garg, 40 hrs)
- https://nptel.ac.in/courses/106/105/106105085 (Programming & Data structure ,IIT Kharagpur , Dr.P.P.Chakraborty , 40 Hrs)
- 3. https://onlinecourses.nptel.ac.in/noc22_cs26/preview (Programming, Data Structures And Algorithms Using Python,, Chennai Mathematical Institute,By Prof. Madhavan Mukund ,38 hrs)

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Passing
Continuous	Faculty	5	5	5	5	5	25	20
Evaluation(CCE)	Department	5 Unit Te (UT1)	5 est 1	5	5 Unit (UT2)	5 Test 2	25	
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	20

Scheme for Theory Evaluation



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CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	-	-	-	-	-	2	2	1	2
CO2	3	2	2	2	2	-	-	-	-	-	2	2	-	-
CO3	2	2	3	2	2	-	-	-	-	-	2	1	2	2
CO4	3	3	3	2	2	-	-	-	-	-	2	2	1	1
CO5	3	3	3	2	2	-	-	-	-	-	3	2	1	1

3: High, 2: Moderate, 1: Low, 0: No Mapping



B Tech inA	I & DS]	Engineering	SYB	Tech	Sem	ester III (2024	COUR	SE)			
Course Ca	itegory	Program Core Course2				Course Code	AD124PC302				
Course Tit	tle				Fundamentals of Data Structure Lab						
Teaching S	Scheme					Evaluation Scheme					
						From	Lab % Marks				
L (Hr)	T (Hr)	P (Hr)	CI			Ехаш	Max %	Min P	marks assing	for	
-	-	2			1	CCE	50	20	10		
Total Hours:26						ESE	50	20	40		

Prerequisites: Programming and Problem Solving, OOP

Course Objective: After successful completion of the course the student will be able to:

- 1. **Provide** a strong foundation in fundamental data structures and algorithm design techniques to enable students to effectively analyze, implement, and optimize solutions for computational problems using Python and C++ languages.
- 2. **Analyze and apply** the fundamental concepts of data structures like arrays, linked lists, stacks, and queues, using Python and C++, to solve computational problems efficiently.
- 3. **Develop** algorithmic problem-solving skills by implementing various techniques such as searching, sorting, and recursion for practical and real-world scenarios.
- 4. Analyze and optimize algorithms in terms of time and space complexity, ensuring efficient implementation of data structure-based solutions in diverse applications.

Course Outcomes: After successful completion of the course the student will								
CO1	Comprehend and Demonstrate the basic data structure operations,	BTL2						
	including arrays, strings, linked lists, stacks, and queues.							
CO2	Apply different algorithms and techniques to solve computational problems.	BTL3						
CO3	Analyze and Implement the time and space complexity of algorithms and compare their efficiency using appropriate metrics.	BTL4						
CO4	Compare and Implement data structures using different algorithms in real-world applications like expression conversion, sparse matrix operations, and circular queue simulations.	BTL4						

Guidelines

Course Design and Assessment:

- The assignments are divided into groups (A, B, C, and D), with specific implementation requirements.
- Group A and B assignments are to be implemented using Python, focusing on fundamental operations without using built-in methods for core functionalities.



• Group C and D assignments are to be implemented using C++, emphasizing advanced structures and real-world problem applications. a minimum of 9 assignments must be completed, covering at least 2 assignments from group A, Group B & group C respectively and 3 assignments from group D.

Laboratory Journal Submission:

Students must maintain a laboratory journal with a structured format:

- Title, Objective, Problem Statement, and Outcomes.
- Theory (Concepts and Algorithms), Flowchart, and Test Cases.
- Program Code, Sample Output, Conclusion, and Analysis.
- Journals must be handwritten for problem-solving write-ups but may include soft copies of code and outputs to reduce paper usage.

Evaluation and Assessment:

Continuous evaluation based on:

- Timely submission of assignments.
- Code efficiency and innovation.
- Problem-solving and debugging skills.
- Punctuality and active participation.

Practical examination must include problem-solving demonstrations, viva voce, and code walkthroughs to assess conceptual clarity.

	Syllabus
	GROUP A
PR1	Implement a python program to store the marks scored by students in a particular subject. Write functions to compute Average, Maximum score, Minimum score and total count of absent students using lists.
PR2	Implement following operations on Two Dimensional Arrays a. Addition of Two matrices b. Subtraction of Two matrices c. Multiplication of Matrices d. Transpose of Matrix
PR3	 Implement a python program to compute following operation on string: - A. Count the Number of Vowels and Consonants from the input string B. Reverse the Words in the string without changing their order. C. Find the Longest Word in the string
	GROUP B
PR4	Implement a python program to store employee IDs in an array those who attended the



	training program in random order. Perform following tasksA. Search whether a particular employee attended a training or not using linear searchB. Search whether a particular employee attended a training or not using binary search
PR5	Implement a python program to store the percentage of students in an array. write function for sorting array of floating points numbers in ascending order usingA. Selection sort and Insertion sortB. Quick sort and bubble Sort
PR6	 You are a software engineer tasked with developing a backend system for an online library. The library maintains a vast database of books, each with attributes like Book ID, Title, Author, Publication Year, and Category. The library system should allow users to: 1. Search for a book based on specific attributes (e.g., Book ID, Title) using sentinel search and indexed sequential search 2. Sort books for display based on criteria like alphabetical order of titles, publication year, or author's name using insertion sort and Shell sort
	GROUP C
PR 7	 GROUP C The Department of AI & DS has a student's club named 'ISA'. Students of second and third year of department can be granted membership on request. Similarly one may cancel the membership of a club. First node is reserved for the president of the club and the last node is reserved for the secretary of the club. Write C++ program to maintain club member's information using Singly linked lists. Store student PRN and Name. Write functions to: A. Add and delete the members as well as president or even secretary. B. Compute total number of members of clubDisplay members C. Two linked lists exist for two divisions. D. Concatenate two lists



PR9	Develop a Ride-Sharing Service Queue Management System using linked list data structures to handle the following requirements:
	Maintain a singly linked list to store ride requests, where each request contains a unique ride ID, pickup location, drop-off location, rider name, and status (e.g., pending, in-progress, completed).
	Allow insertion of new ride requests at any position (e.g., based on priority) and deletion upon ride completion or cancellation.
	GROUP D
PR10	Implement a C++ program to check if a mathematical expression is well-parenthesized using a stack. The program should:
	A. Accept an expression containing parentheses (), curly braces {}, and square brackets [].B. Push opening brackets onto the stack.C. Pop and match with closing brackets to ensure they are balanced and properly nested.
	Display whether the expression is balanced or not.
PR11	A restaurant accepts maximum M orders. Orders are served on a first come first served basis.Order once placed cannot be cancelled. Write C++ program to simulate the system using a circular queue using arrays
PR12	Implement a C++ program to simulate an online ticket reservation system using a double-ended queue (deque). The program should support the following operations:
	A. Add a customer at the rear for regular ticket booking.B. Add a VIP customer at the front for priority ticket booking.C. Serve customers from the front of the queue.D. Display the current queue of customers waiting for tickets.
	Check if the queue is full or empty.
PR13	Design an Airport Baggage Handling System using a circular queue to manage the movement of luggage on a conveyor belt. Implement the following operations:
	 Add Luggage: Place new luggage on the conveyor belt. Remove Luggage: Remove luggage once it reaches the pickup point. Overflow Handling: Ensure the system prevents adding luggage when the conveyor belt is full. Underflow Handling: Display a message when the conveyor is empty.
Text Book	s:



- 1. Horowitz and Sahani, "Fundamentals of Data Structures in C++", University Press, ISBN 10:0716782928 /ISBN 13: 9780716782926.
- 2. Brassard & Bratley, "Fundamentals of Algorithms", Prentice Hall India/Pearson Education, ISBN 13-9788120311312.

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Linked List, https://ds1-iiith.vlabs.ac.in/exp/linked-list/index.html

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MOOCs:

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- https://nptel.ac.in/courses/106/105/106105085 (Programming & Data structure ,IIT Kharagpur , Dr.P.P.Chakraborty ,40 hrs)
- https://onlinecourses.nptel.ac.in/noc22_cs26/preview (Programming, Data Structures And Algorithms Using Python, Chennai Mathematical Institute, By Prof. Madhavan Mukund ,38 hrs)



Scheme for Practical Evaluation

Component	Level	Parameters	Marks	Total	Passing
Continuous	Progressive	Understanding Viva Voce	20	50	20
Comprehensive Evaluation (CCE)	Evaluation	Involvement, Participation, and Engagement	10		
		Quality of Submission of Report	10		
		Attendance	10		
	End	Performance	25	50	20
	Evaluation	Oral Examination	25		

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	-	-	-	-	-	2	3	2	2
CO2	3	3	2	2	2	-	_	-	-	-	2	3	3	2
CO3	3	3	3	2	2	-	_	-	-	-	2	3	3	2
CO4	3	3	3	2	2	1	_	-	-	1	1	2	3	2

3: High, 2: Moderate, 1: Low, 0: No Mapping



B Tech inAI & DS Engineering | S Y B Tech Semester III (2024 COURSE)

Course	Categor	у		Program Core Cours 3	e		Course Code	AD124P	C 303	
Course	Title			Statistical M	Statistical Methods					
		Feaching	Scheme		Evaluation Scheme					
					The	ory Ma	rks	Prac M	tical % arks	
L (Hr)	T (Hr)	P (Hr)	Cr	Exam	Max %	Min Passi	Marks fo ng	or Max	Min Marks for Passing	
3	-	-	3	ССЕ	50	20				
Total H	ours:39			ESE	50	20	40	-	-	

Prerequisites: Discrete Mathematics and Basic Fundamentals of Probability **Course Objective:** After successful completion of the course units the student will be able to

1. **Demonstrate** knowledge of probability

2. Apply the standard statistical methods

Course Outcomes: After successful completion of the course units the student will

CO1	Identify the use of appropriate statistical terms to describe data	BTL2
CO2	Apply appropriate statistical methods to collect, organize, display relevant data	BTL3
CO3	Apply distribution functions for random variables	BTL4
CO4	Construct the confidence Intervals for sample mean and sample proportion and determine sample size using estimation	BTL5
CO5	Distinguish between Type-I and Type-II error and specify most appropriate test of hypothesis in a given situation	BTL5

	Syllabus							
Unit I	Descriptive Statistics	8 Hrs						
Population and Sample:Population and Sample, Sampling Methods, Sampling with and without								
replacemen	t,Random Numbers,Population Parameters	,Frequency						
distribution	,Histogram,Frequency Polygon							
Central Ten	dency: Mean, Mode, Median, range, standard deviation, Coefficient of varia	tion						
Case Studi	es:Case study of sampling for any real-world problem like exit poll statist	ics						
Unit II	Descriptive Statistics: Measures of Dispersions	8 Hrs						



Moments ,skewness ,kurtosis, Coefficient of Correlation ,Regression ,Lines of Regression								
case Studies: Create measures of dispersion for a real life example dataset like students dataset,								
Unit IIIProbability Distribution8 Hrs								
Random variables Discrete Random Variable ,Probability Mass Function, Continuous random	m							
Variable ,Probability Density Function,Binomial Distribution, Poisson Distribution, Norma	al							
Distribution	_							
Case Studies: Use Binomial distribution, for the problem of reducing errors by vendors when process credit-card applications for a large credit-card bank etc.	10							
Unit IV Estimation 8 Hrs								
Types of Estimation Point estimation Interval Estimation criteria for goo	h							
estimates (unbiasedness, consistency), Confidence interval, Methods of estimation includin maximum likelihood estimation	ng							
Case Studies: Estimate the population parameter by using sample statistics for data to b	be							
generated through questionnaire								
Unit VHypothesis Testing7 Hrs								
Introduction, Null hypothesis, Alternative hypothesis, Critical Region, Types of Error, Level of	of							
significance, Power of test test, T test, F test, chi square test								
Case Studies: Hypothesis Testing for examples like: Dieters lose more fat than the exercisers	s,							
New medicine testing								
Text Books:								
 S. C. Gupta, V. K. Kapoor, "Fundamentals of Mathematical Statistics (A Modern Approach)", Sultan Chand & Sons Educational Publishers, Tenth revised edition, ISBN: 81-7014-791-3 	1 :							
2. J. Medhi, "Statistical Methods: An Introductory Text", Second Edition, New Age	e							
International Ltd, ISBN: 8122419577								
Reference Books:								
 Glen Cowan, "Statistical Data Analysis", University Of Siegen, Clarendon Press, Oxford, 1998, ISBN: 0198501552 	,							
2. Ken Black, "Applied Business Statistics", Wiley, 7th Edition, ISBN: 9788126537075								
3. Introduction to the Theory of Statistics, A.M. Mood, F.A. Graybill and D.C. Boer	s,							
McGraw Hill.								
Journal Papers:								
Khushbu Kumari, Suniti Yadav "Linear Regression Analysis Study"Journal of the Practice of Cardiovascular Sciences · 2395-5414, Volume 4 (1), January 2018.	of							
V Lau.								

Probability and Statistics:

https://ps-iitd.vlabs.ac.in/List%20of%20experiments.html

MOOCs:



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- 1. Introduction to Probability and Statistics <u>https://onlinecourses.nptel.ac.in/noc20_ma22/previ</u>2
- 2. Introduction to Data Analytics https://nptel.ac.in/courses/110/106/110106072/
- 3. Introduction to Statistics https://onlinecourses.nptel.ac.in/noc25_ma36/announcements?force=true

Scheme for Theory Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Passing
Continuous	Faculty	5	5	5	5	5	25	20
Evaluation(CCE)	Department	5	5	5	5	5	25	
Evaluation(CCE)		Unit Test (UT1)	1		Unit T (UT2)	Cest 2		
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	20

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	-	-	1	-	-	1	_	-	-	-	_	-
CO2	2	2	-	-	1	-	-	1	_	-	-	-	_	_
CO3	2	2	-	-	1	-	-	1	_	-	-	-	_	-
CO4	2	2	-	-	1	-	-	1	_	-	-	-	_	-
CO5	2	2	-	-	1	-	-	1	_	-	-	-	_	-

3: High, 2: Moderate, 1: Low, 0: No Mapping



B Tech in AI & DS Engineering | S Y B Tech Semester III (2024 COURSE)

Course	Category	Program Core Course 4	Course Code AD124PC					04		
Course	Title		Software	Software Engineering						
Teachin	g Scheme		Evaluatio	n Schen	ne					
					Tł	eory Marks		Practical Marks		
L (Hr)	T (Hr)	P (Hr)	Cr	Exam	Max %	Min Marł for Passi	ks ng	Max Min Max Marks for Passing		
3	-	-	3	ССЕ	50	20				
Total H	ours:39	ESE	50	20	40	-	-			

Prerequisites: None

Course Objectives: After successful completion of the course units the student will be able to

- 1. Learn and analyze Fundamentals of software engineering.
- 2. **Evaluate** methods of capturing, specifying, visualizing and analyzing software requirements.
- 3. Apply Design principles to software project development
- 4. Analyze different stages of project management through the life cycle of the project.
- 5. Apply software testing principles to software project development

Course Outcomes: After successful completion of the course units the student will

000	ise outcomest inter successful completion of the course units the student with	
CO1	Identify and apply software engineering principles, process models, and	BTL2
	methodologies to software development projects.	&
		BTL3
CO2	Use software requirements using appropriate techniques and tools, following	BTL3
	IEEE standards for Software Requirements Specifications (SRS).	
CO3	Analyze components using object-oriented principles and Design software	BTL4
	architectures	
CO4	Select software project management techniques to ensure successful project	BTL5
	delivery and quality.	
CO5	Develop effective, reliable and secure software applications by Utilizing various	BTL6
	testing strategies and tools.	

	Syllabus	
Unit I	Introduction	8 Hrs
Definition Software a models, V manageme	and scope of software engineering, Software Characteristics, Software applications, Software Engineering Principles, Software Development life Vaterfall model, iterative model, Spiral Model, Agile model, basis ent, AI-assisted development workflows, Low-code/no-code platform	re Components, e cycle, process cs of software ns, DevSecOps



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integration.						
Case Study : Analyzing Uber's engineering excellence through modern agile tools implementation: How Uber utilized JIRA for tracking feature development and bug fixes across distributed teams, implemented Git-based workflows for their monorepo-to-microservices transition, integrated AI pair-programming tools for developer productivity, and employed AI-assisted code generation to accelerate development cycles while maintaining code quality and consistency standards.						
Unit II Requirements Engineering 8 Hrs						
Requirements elicitation techniques, Requirements specification and documentation, Use Case modelling, Requirements validation and management, Information Modelling, Data Flow Diagram, Entity Relationship Diagram, UML Diagrams (Class, Sequence, Activity, and State diagrams), Impact of Requirement engineering, Decision tables, SRS Documents, IEEE standards for SRS, Natural Language Processing for requirements analysis, AI-driven requirements validation. Case Study: Write SRS in IEEE format for AI-Powered Content Recommendation System.						
Unit III Software Design 8 Hrs						
Design principles and patterns, Architectural Design, Object-Oriented Design, Function-Oriented Design, Design documentation techniques, Design Specification, Cohesiveness and Coupling, Overview of SA/SD methodology, Advanced UML modeling for system design, Microservices architecture, Serverless design patterns, AI-driven design optimization, Container orchestration considerations. Case Study: Design Smart Home Automation System (system to control appliances based on user						
Unit IV Software Project Management & Reliability 8 Hrs						
Outer VSoftware Project Management & KenabilityFormationProject and Project Management, Project Scheduling, Risk management, Project Maintenance, Token Count, Function Count, Cost estimation using models like COCOMO, etc. Reliability Issues, Reliability Metrics, Reliability Models, Software Quality, Feature Engineering for software enhancement, AI-ML project management frameworks, Quantum-resilient software planning, Green software engineering practices, Carbon footprint optimization.Case Study:Design a Secure and User-Friendly Mobile Banking System (A mobile banking application development project required effective project scheduling, risk management, and maintenance to another to another delivery and which like point						
Unit V Software Testing 7 Hrs						
Unit VSoftware Testing7 HrsVerification & Validation: principles, techniques and documentation, Testing Levels: Unit, Integration, System, and Acceptance Testing, Testing Approaches: Top-Down, Bottom-Up, Structural, Functional, Software Testing Strategies, Data Testing methodologies, Testing Conventional applications: object oriented applications, web applications, Validation Testing frameworks and tools, AI-driven automated testing, Generative AI for test case creation, Security vulnerability testing, Privacy compliance testing frameworks, Cross-chain application testing.						
Case Study: Tools or combination of tools to test 'E-Commerce Payment Gateway System' (address various aspects of the system: functional testing, security testing, performance testing, compliance testing)						
Text Books:						
 R. S. Pressman, "Software Engineering – A practitioner's approach", 3rd Ed., McGraw Hill Int. Ed,1992 Ian Sommerville, "Software Engineering", Addison and Wesley, ISBN 0-13-703515-2 						



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Reference Books:
1. K. K. Aggarwal & Yogesh Singh, "Software Engineering", 2ndEd., New Age International,2005
2. Carlo Ghezzi, "Fundamentals of Software Engineering", PHI, ISBN-10: 0133056996 Rajib Mall, "Fundamentals of Software Engineering", PHI, ISBN-13: 978-8120348981
3. Pankaj Jalote, "An Integrated Approach to Software Engineering", Springer, ISBN 13: 9788173192715.
 S K Chang, "Handbook of Software Engineering and Knowledge Engineering", World Scientific, Vol I, II, ISBN: 978-981-02-4973-1
Journal Paper:
 H. Edison, X. Wang and K. Conboy, "Comparing Methods for Large-Scale Agile Software Development: A Systematic Literature Review," in IEEE Transactions on Software Engineering, vol. 48, no. 8, pp. 2709-2731, 1 Aug. 2022, doi: 10.1109/TSE.2021.306903
Vlab:
1. Creative Design, Prototyping & Experiential Lab: <u>https://cpe-iitg.vlabs.ac.in/Introduction.html</u>
MOOCs:
 Software Engineering <u>https://swayam.gov.in/nd1_noc19_cs69/preview</u> <u>https://swayam.gov.in/nd2_cec20_cs07/preview</u>

- 2. Software Testing
 - https://onlinecourses.nptel.ac.in/noc25_cs66/preview •

Scheme for Theory Examination

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Passing
Continuous	Faculty	5	5	5	5	5	25	20
Evaluation(CCE)	Department	5	5	5	5	5	25	
Evaluation(CCE)		Unit T (UT1)	est 1		Unit (UT2)	Test 2		
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	20

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	-	-	-	2	-	-	-	-	-	-	-	-
CO2	3	2	2	-	2	2	2	-	2	1	1	2	-	-
CO3	3	3	2	-	-	-	-	-	-	2	2	2	1	1
CO4	2	2	2	-	-	-	-	1	-	3	2	2	1	2



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-	•		-		-	_				-	_	-	-	_
CO5	3	3	3	1	3	-	-	-	-	2	3	3	2	3

3: High, 2: Moderate, 1: Low, 0: No Mapping



B Tech inAI & DS Engineering | S Y B Tech Semester III (2024 COURSE)

Course Catego	Course Multidisciplinary Category Minor 1			Course	Course Code AD124MD305					
Course Title			Fundam Intellige	Fundamentals of Artificial Intelligence						
Teaching Scheme				E	valuatior	ı Scher	ne			
					Theory N			Prac M	tical % arks	
L (Hr)	T (Hr)	P (Hr)	Cr	Exam	Max %	Min M for Pas	larks sing	Max	Min Marks for Passing	
2	-	-	2	ССЕ	50	20				
Total H	lours: 2	6		ESE	50	20	40	-	-	

Prerequisites:

- 1. Basics of Programming (Python preferred)
- 2. Discrete Mathematics
- 3. Introduction to Data Structures and Algorithms

Course Objectives: After successful completion of the course the student will be able to

- 1. Explore the basic concepts, techniques, and applications of Artificial Intelligence.
- 2. Apply problem-solving methods and search algorithms.
- 3. Analyse the fundamentals of knowledge representation and reasoning.
- 4. Evaluate Artificial Intelligence-Ethics relationship
- 5. Investigate future trends in Artificial Intelligence.

Course Outcomes: After successful completion of the course the student will								
CO1	Demonstrate Artificial Intelligence concepts and architecture for	BTL2						
	learning agents.							
CO2	Apply search algorithms for problem solving in Artificial Intelligence.	BTL3						
CO3	Analyse Knowledge representation and Reasoning Techniques in							
	Artificial Intelligence to solve complex tasks.							
CO4	Evaluate ethical implications of Artificial Intelligence technologies for	BTL5						
	Bias, Fairness, Privacy concern, Accountability and transparency.							
CO5	Investigate future trends in AI and create learners who will look for							
	prospective applications							

Syllabus							
Unit I	Fundamental of Artificial Intelligence	6 Hrs					
Introduction to Artificial Intelligence, History of Artificial Intelligence, applications of AI in							
various domains, Intelligent agents, Agent architecture, different types of agents, environment,							
types of environment, AI Umbrella Term							



CaseStudies:

1. The Evolution of IBM Watson : Background, core problems, key challenges, objectives

2.ChatGPT by OpenAI:Strategic Development, User Engagement and Adoption, Revenue and Sustainability

3.Autonomous Vehicles: The Development and Deployment of Autonomous Vehicles, Challenges and Opportunities in the Autonomous Vehicle Industry

Unit II **Problem Solving and Search**

6 Hrs

Basic Problem-Solving Techniques: Problem formulation, Types of search algorithms: uninformed search and informed search, State Space search Heuristic Search Heuristic search techniques: heuristic search, Hill climbing, Best first search, A* & AO* search, Constraint satisfaction ,Game Theory: Minimax searching algorithm, Alpha-beta pruning

CaseStudies:

1. Robot Pathfinding: design and optimization of robot pathfinding algorithms to ensure efficient, safe, and reliable navigation in dynamic and complex environments

2. Navigation in Google Maps: continuous enhancement in navigation system to deliver accurate, real-time, and user-friendly guidance

3. Chess AI : design, training, and utilization of Artificial Intelligence in chess to push the boundaries of strategic gameplay, enhance learning experiences

Unit III Knowledge Representation and Reasoning

5 Hrs Introduction, Different types of Knowledge, Knowledge representation in Artificial Intelligence Rule based system, semantic net, reasoning in semantic net, frames, script, conceptual dependency Reasoning Techniques: propositional logic, reasoning patterns in propositional logic, first order logic, inferences in first order logic Forward and backward chaining, Resolution in propositional and first-order logic

CaseStudies:

1.Medical Diagnosis System: Design, implementation, and scaling of AI-powered medical diagnosis systems to improve healthcare outcomes, enhance accessibility

2. Automated Legal Reasoning System: development and deployment of automated legal reasoning systems to enhance efficiency, accuracy, and accessibility in the legal profession

Ethics and Social Implications in AI Unit IV

5 Hrs

Bias and Fairness in AI Systems , Privacy Concern, Accountability and Transparency in AI Ethical Implications of AI in Society

CaseStudies:

1. Tesla's Autopilot Incidents: Addressing safety, ethical, and regulatory Concerns arising from Autopilot incidents to improve trust, ensure user safety

2.Cambridge Analytica and Facebook :lessons can be learned from the Cambridge Analytica and Facebook data scandal about balancing user privacy, data ethics, and corporate accountability in the age of big data and social media platforms

Future of Artificial Intelligence Unit V

4 Hrs Emerging Technologies in AI, Challenges in Achieving Artificial General Intelligence (AGI) **Prospective Applications and Advancements**

CaseStudies:

1.AI in Predicting Climate Change Impacts Investigate how AI-driven climate models are helping predict environmental changes and their societal implications.

2.Smart Cities Powered by AI Examine AI-driven smart city projects, like Singapore's Smart Nation initiative, focusing on traffic management, urban planning, and sustainable living.

Text Books:



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- Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach (3rd Edition)Pearson, ISBN: 9780136042594,2009
 Nila L Nilagon Principles of Artificial Intelligence Springer ISBN: 0782540182702, 2014
- Nils J. Nilsson, Principles of Artificial Intelligence, Springer, ISBN: 9783540183792, 2014
 Nils J. Nilsson, Quest for Artificial IntelligenceCambridge University Press ISBN: 9780521122931,2010

References Books:

- 1. Nils J. Nilsson"Artificial Intelligence: A New Synthesis", Publisher: Morgan Kaufmann,ISBN: 978-15586046741998
- 2. Avron Barr and Edward A,"The Handbook of Artificial Intelligence" Publisher: Heuris Tech Press,1981
- 3. Toshinori Munakata"Fundamentals of the New Artificial Intelligence: Neural, Evolutionary, Fuzzy and More" by Publisher: SpringerISBN: 978-1447120213,2008
- 4. George F. Luger,"Artificial Intelligence" by Publisher: PearsonISBN:978-0136042594,2008

Journal Papers:

- 1. Albert Chun-Chen Liu, Oscar Ming Kin Law, Iain Law, Understanding Artificial Intelligence: Fundamentals and Applications, IEEE,2022
- Jiaying Liu, Xiangjie Kong, Feng Xia, Xiaomei Bai, Lei Wang, Qing Qing, Artificial Intelligence in the 21st Century, Special Section On Human-Centered Smart Systems And Technologies, IEEE, March 2018 VOLUME6, DOI:10.1109/ACCESS.2018.2819688Corpus ID: 49728291.
- 3. Yang Zeng; Bolin Liao; Zhan Li; Cheng Hua; Shuai Li,A Comprehensive Review of Recent Advances on Intelligence Algorithms and Information Engineering Applications, IEEE Date of Publication: 16 September2024 Vol12,DOI: 10.1109/ACCESS.2024.3461756
- 4. Av. Karthick; S. Gopalsamy Artificial Intelligence: Trends and Challenges Seventh International Conference on Parallel, Distributed and Grid Computing (PDGC), IEEE, 2022 DOI:10.1109/PDGC56933.2022.10053238

VLab:

1. VLab :<u>https://ps-iiith.vlabs.ac.in/</u> problem solving Lab by IIT hyderabad

MOOCs:

- NPTEL: Fundamentals of Artificial Intelligence <u>https://onlinecourses.nptel.ac.in/noc21_ge20/preview</u> By Prof. Shyamanta M. Hazarika, IIT Guwahati
- 2. An Introduction to Artificial Intelligence <u>https://onlinecourses.nptel.ac.in/noc22_cs56/preview</u> by By Prof. Mausam, IIT Delhi

Scheme for Theory	y Evaluation
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Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Passing
Comprehensiv	Faculty	5	5	5	5	5	25	20
Comprehensiv	Department	5	5	5	5	5	25	



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	-				-		-	
e Evaluation	Unit Te	st 1		Unit Tes	st 2			
(CCE)		(UT1)			(UT2)			
End Semester	Institute	10	10	10	10	10	50	20
Examination								
(ESE)								

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	-	1	-	-	-	-	1	1	2	3	2	1	2
CO2	3	3	2	3	2	-	-	1	1	1	2	1	2	1
CO3	3	2	2	2	2	2	-	1	1	1	1	2	1	1
CO4	1	1	3	3	2	2	3	1	1	1	1	1	1	2
CO5	1	1	2	2	-	3	-	3	-	3	3	1	2	1

3: High, 2: Moderate, 1: Low, 0: No Mapping



B Tech inAI & DS Engineering | S Y B Tech Semester III (2024 COURSE)

Course Category	ý	Open Elective 1		Course Code	rse AD124OE306 e					
Course 7	ſitle			Critical Thinking and Problem Solving						
	Te	aching Sch	eme]	Evaluation	Sche	me		
				Theory Marks				Practical Marks		
L (Hr)	T (Hr)	P (Hr)	Cr	Exam	Max %	Min M for Pass	arks ing	Max %	Min Marks for Passing	
3	1	-	4	CCE	50	20				
Total Hours: 52				ESE	50	20	40	-	-	

Prerequisites: None

Course Objectives: After successful completion of the course units the student will be abe to

1.Develop students' ability to analyze and evaluate information critically for informed decision-making.

2. Enhance logical reasoning and structured problem-solving skills for real-world applications.

3. Introduce creative thinking techniques and frameworks to approach problems innovatively.

4. Strengthen decision-making abilities by applying structured problem-solving methodologies.

5. Equip students with competitive problem-solving techniques to prepare for industry challenges and technical assessments.

Course	Course Outcomes: After successful completion of the course units the student will								
CO1	Apply and evaluate arguments, assumptions, and biases to make informed decisions.	BTL3							
CO2	Apply and analyze logical reasoning techniques to define, structure, solve problems systematically.	BTL3							
CO3	Model lateral thinking and creative techniques to generate innovative solutions.	BTL3							
CO4	Utilize effective decision-making models and strategies in complex scenarios.								
CO5	Analyze algorithmic and real-world challenges using structured problem-solving approaches in competitive environments.	BTL4							

Syllabus								
Unit I	Foundations of Critical Thinking and Problem-Solving	10 Hrs						
Understanding C Thinkers. The Pro-	Critical Thinking: Importance & Applications, Characteristics of soblem-Solving Mindset: Curiosity, Skepticism, and Open-Mindedness,	Strong vs. Wea Cognitive Biase						



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and Logical Fallacies, Thinking Structures: Inductive, Deductive & Abductive Reasoning

Case Study & Activities:

Case 1: Analyzing Poor Decision-Making in Corporate Failures (e.g., Nokia, Blockbuster) **Activity**: Identifying Biases and Fallacies in Media & News

Unit IIProblem-Solving Strategies & Decision-Making Skills11 Hrs

The 5-Step Problem-Solving Process, Root Cause Analysis (5 Whys, Fishbone Diagram), Decision-Making Models (Rational Model, Intuitive Model, Vroom-Yetton), Problem-Solving in Group Settings: Brainstorming & Consensus-Building, The Role of Emotional Intelligence in Problem-Solving

Case Study & Activities:

Case 1: How Leaders Solve Crises (Airbnb's COVID-19 Response, Elon Musk's Twitter Reforms)

Activity: Team-Based Problem-Solving Simulation

Unit III	Creativity and Innovation in Problem-Solving	10 Hrs

Divergent vs. Convergent Thinking, Lateral Thinking Techniques (Six Thinking Hats, Random Stimuli Method), Overcoming Mental Blocks & Assumptions, The Psychology of Innovation & Risk-Taking, Developing a Growth Mindset for Continuous Improvement

Case Study & Activities:

Case 1: Creative Thinking in Crisis Management (Netflix's Business Pivot from DVDs to Streaming)

Activity: Reverse Brainstorming – Identifying "What Could Go Wrong?"

Unit IV	Critical Thinking in Communication and Negotiation	11 Hrs
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Evaluating Information Objectively: Spotting Misinformation & Fake News, Persuasive Argumentation: Structuring Sound Arguments, Conflict Resolution and Negotiation Skills, Assertive vs. Aggressive vs. Passive Communication, Ethical Decision-Making in Professional Settings

Case Study & Activities:

Case 1: The Role of Critical Thinking in Conflict Resolution (Apple vs. Samsung Legal Battle)

Activity: Debate Exercise – Arguing Both Sides of a Controversial Issue

Unit V	Competitive Pressure	Problem-Solving	and	Decision-Mal	king	under	10 Hrs	
Time-Sensitive De	cision-Making,	Stress and Problem-So	olving:	How to Stay Ca	lm Ur	nder Pres	sure, Gamific	ation
of Problem-Solving (Escape Rooms, Puzzles, Logical Deductions), Real-World Problem-Solving Challenges								
(Case-Based Appro	bach), Preparing	for Situational Judgen	nent Te	sts & Competitiv	e Inter	rviews		



Case Study & Activities:

Case 1: How Leaders Make Split-Second Decisions (Captain Sully's Hudson River Landing)

Activity: Timed Puzzle Solving & Case-Based Group Challenges

Text Books:

- 1. Gregory Bassham, William Irwin, Henry Nardone, James M. Wallace, Critical Thinking: A Student's Introduction, McGraw-Hill Education, 5th Edition (2012), oISBN: 978-0078038310
- 2. Charles L. Phillips, The Fundamentals of Critical Thinking and Problem Solving, Cognella Academic Publishing,1st Edition (2018), ISBN: 978-1516515306
- 3. Jeff Butterfield, Problem-Solving and Decision-Making: Illustrated Course Guides, Cengage Learning, 1st Edition (2013), ISBN: 978-1285082260

Reference Books:

- 1. Daniel Kahneman Thinking, Fast and Slow, Farrar, Straus, and Giroux, 1st Edition (2011), ISBN:978-0374533557
- Edward de Bono, Lateral Thinking: Creativity Step by Step, Harper Business, 1st Edition (2015), ISBN: 978-0066620531
- 3. George Pólya , How to Solve It: A New Aspect of Mathematical Method, Princeton University Press, 2nd Edition (2004), ISBN: 978-0691119663

MOOCs:

- 1. Critical Thinking & Problem-Solving, Platform: edX, Institution: Rochester Institute of Technology (RIT)
- 2. Solving Problems with Creative and Critical Thinking, Platform: Coursera, Institution: IBM

Scheme for Theory Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Passing
Continuous	Faculty	5	5	5	5	5	25	20
Evaluation (CCE)	Department	5	5	5	5	5	25	
	-	Unit Test 1 (UT1)			Unit (UT2)	Test 2		
End Semester	Institute	10	10	10	10	10	50	20
Examination								
(ESE)								



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CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	1	2	-	-	-	1	2	3	1	2	2	1
CO2	3	3	2	3	1	-	-	-	2	2	1	2	3	2
CO3	2	3	3	3	2	1	-	-	2	2	2	2	2	3
CO4	2	2	3	3	2	1	-	-	3	3	2	2	2	2
C05	3	3	3	3	3	1	-	-	3	3	3	2	2	2

3: High, 2: Moderate, 1: Low, 0/-: No Mapping

Note:As per DYPCOE NPTEL Credit Transfer Policy, Credit Transfer is applicable for NPTEL/SWAYAM courses that are aligned with Program-Specific Electives, Open Electives and Additional Learnings like Non-Credit Courses etc.



BTech in AI & DS Engineering | S Y B Tech Semester III (2024 COURSE)

Course Categor	·у	Economic Finance Entrepres	cs and for neurs	Course C	Course Code AD12			24EE307		
Course	Title			Project N	lanag	ement				
Teachin	g Schen	ne	Evaluatio	n Sch	eme					
					Theory Marks			Practical Marks		
L (Hr)	T (Hr)	P (Hr)	Cr	Exam	Max %	Min Marl for	KS	Max %	Min Marks for Passing	
						Passi	ng			
2	-	-	2	CCE	50	20				
Total Hours:26				ESE	50	20	40	-	-	

Prerequisites: Fundamentals of Management, Indian Construction Industry, Economics

Course Objectives: After successful completion of the course units the student will be able to

1. Understand concepts involved in project Management.

2. Understand scientific methods Project Planning and Scheduling

3. **Study** methods of Project Monitoring and Control

4. Understand the methods of Project resource management and site planning.

5. Understand the security and data safety measures of Project resource management.

Cour	Course Outcomes: After successful completion of the course units the student will									
CO1	Apply project life cycle and the domains of Project Management.	BTL2								
CO2	Apply networking methods and their applications in project planning and management.	BTL2								
CO3	Demonstrate project monitoring techniques and their applications in project control.	BTL3								
CO4	Analyze site layout as per the progress of site and apply safety norms.	BTL4								
CO5	Create optimized project plans integrating time, cost, and resource management.	BTL6								

Syllabus									
Unit IIntroduction to Project Management6 Hrs									
Importance as Categories of Introduction t	Importance and Objectives of Project Management, Basic Principles of Managing Software Projects, Categories of AI/DS Projects, Common Causes of Project Failure, Simple Project Life Cycle Concepts, Introduction to PMBOK.								
Case Study: "Spotify's Discover Weekly Feature" - Examining how Spotify managed the development project for their personalized playlist feature, demonstrating basic project management principles in a real-world AI application.									
Unit II	Project Planning and Scheduling	5 Hrs							



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Basic Organizational Structures in Software Development, Role of Project Managers, Team Composition for AI/DS Projects, Stakeholder Management, Communication Frameworks, Responsibilities Distribution.

Case Study: "Weather Prediction App Development" - A step-by-step analysis of planning and scheduling a simple weather prediction application, showing how tasks are broken down, scheduled, and critical paths identified.

Unit III Project Monitoring and Control

Introduction to Work Breakdown Structure (WBS), Understanding Gantt/Bar charts, Basics of Network Planning, Introduction to Critical Path Method, Simple Precedence Relationships.

Case Study: "Student Attendance System" - Following the monitoring and control process of developing a facial recognition-based attendance system for a university, highlighting tracking methods and progress evaluation.

Unit IV

Project Resources and Site Planning

Overview of P.E.R.T. Analysis, Planning for Software Development Projects, Basic Resource Allocation Concepts, Simple Time-Cost Optimization, Fundamental Project Monitoring Methods, Introduction to Earned Value Analysis, Understanding Software Development Progress Tracking.

Case Study: "E-commerce Product Recommendation Engine" - Exploring the resource management and infrastructure setup for a basic recommendation system, demonstrating practical data pipeline concepts and development environment configuration.

Unit V Project Resources and Implementation

5 Hrs

Introduction to Data and Software Resource Management, Basic Procurement Procedures for Software Projects, Simple Data Pipeline Concepts, Fundamentals of Development Environment Setup, Introduction to Data Security, Basic Safety Measures in Software Development.

"E-commerce Product Recommendation Engine" - Exploring the resource management and infrastructure setup for a basic recommendation system, demonstrating practical data pipeline concepts and development environment configuration.

Text Books:

- 1. Project planning and Control with PERT and CPM by DR. B.C. Punmia and K.K.Khadelwal Publisher: Firewall Media, Laxmi publication New Delhi.
- 2. Project management Principles and Techniques by B.B. Goel, Publisher: Deep and Deep publisher

Reference Books:

- 1. Project Management by Khatua, Oxford University Press
- 2. Construction Project Management-Planning, Scheduling and Controlling by K. K. Chitkara, Tata McGraw Hill Publishing Company, New Delhi.
- 3. Construction Management and Planning by B. Sengupta and H. Guha, Tata McGraw Hill Publishing Company, New Delhi.
- 4. The Essentials of Project Management by Dennis Lock, Gower Publishing Ltd. UK.
- 5. Essentials for Decision Makers by Asok Mukherjee, Scitech Publication, New Delhi.

Journal Papers:

5 Hrs

5Hrs



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Novy, Martin and NovÃ_ikovÃ_i, Jana and Waldhans, MiloÅ_i Project management in building industry management, 2012, pages 189-198, volume 60, Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis, doi = 10.11118/actaun201260070189 You Tube Link: https://www.youtube.com/watch?v=E2gGF1rburw

Websites:

1. https://www.pmi.org/search#q=pmbok&sort=relevancy

2. https://www.projectmanager.com/blog/precedence-diagramming-method

3. <u>https://pmo.huit.harvard.edu/resource-planning-management%E2%80%8B</u>

4. https://www.wrike.com/project-management-guide/faq/what-is-resource-allocation-in-project-management

Scheme for Theory Evaluation

Component	Level	Unit I	Unit II	Unit III	Unit IV	Unit V	Total	Passing
	Faculty	5	5	5	5	5	20	08
CCE		5	5	5	5	5	20	08
	Department			•				
		Unit Test 1			Unit Tes	t 2		
ESE	Institute	15	15	15	15	15	60	24

CO-PO Mapping

	РО 1	PO 2	PO 3	РО 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO2	PSO3
CO1	-	-	-	-	-	-	1	-	-	2	1	2	3	3
CO2	-	1	-	1	-	-	-	1	1	2	1	3	2	2
CO3	-	1	2	-	-	-	-	-	-	2	1	2	3	2
CO4	-	-	2	1	-	-	-	1	1	2	1	1	2	3
CO5	1	-	2	-	-	-	1	-	2	2	1	2	3	3

3: High, 2: Moderate, 1: Low, 0/-: No Mapping



B Tech inAI & DS Engineering | S Y B Tech Semester III (2024 COURSE)

Course Category		ry	Value Education (VEC) I		CourseCourse Code			AD124VE308				
Course Title Sustainable Development I												
Teaching Scheme Evaluation Scheme												
	**						Theory	y Marks	Practical Marks			
L		Т	1	P	Cr	Exam	Max	Min Marks for Passing	Max	Min for Passing		
2		-	-	-	2							
Total	Hours:26					CCE	100	40	-			
Prerequisites:None												
Course Objectives: After successful completion of the course the student will be												
 achieving them collectively. 3. Understand Environmental Issues – Examine environmental challenges and their impact on sustainable development. 4. Study Environmental Policies – Analyze national and global policies related to environmental sustainability. 5. Learn Intellectual Property Rights (IPR) – Understand the basics of patents, copyrights, trademarks, and their role in innovation. Course Outcomes: After successful completion of the course the student will 												
CO1	CO1 Understand the key concepts of SDGs and apply SDG significance globally and in BTL3 India.											
CO2	O2 Apply SDGs Target and interconnection for holistic impact.								BTL3			
CO3 Analyze key sustainability challenges, stakeholder roles, and plan frameworks for BTL4 SDG-based projects.												
CO4	Examin SDGs	e the ethic	cal co	onsiderat	ions, po	licies, a	nd gove	ernance structures	s supporting	^g BTL4		
Syllabus												
Unit 1		Introduct	tion t	o SDGs	& Susta	inahility	T		6 1	Irs		
Evolution from MDGs to SDGs, significance in the UN 2030 Agenda, India's contributions, real-world applications.												
Unit IISDG Targets & Interconnections6 Hr									[rs			
Understanding SDG indicators, interlinkages, roles of stakeholders, case studies, impact assessment frameworks.												

Environmental Challenges & Sustainability 5 Hrs **Unit III**


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Key environmental issues like climate change, biodiversity loss, pollution; impact on health and society, mitigation strategies.

Unit IV	Environmental Policies & Governance	5 Hrs
National and glosstudies of succes	obal environmental policies, role of regulatory bodies, sustainability sful interventions.	standards, case
Unit V	Introduction to Intellectual Property Rights (IPR)	4 Hrs
	· a · · · · · · · · · · · · · · · · · ·	

Basics of patents, copyrights, trademarks, importance in innovation and sustainability, protection of intellectual property in academia and industry.

- 1. Shradha Sinha, Meet Kamal, Vandana Grover, Textbook of Environmental Studies and Sustainability ,Publisher: AITBS Publishers, India,ISBN: 9789374736982,2024.
- Suriyanarayanan Sarvajayakesavalu, Pisit Charoensudjai, Environmental Issues and Sustainable Development Publisher: IntechOpen Year: 2021ISBN: 9781838809171,2021.

Reference Books:

- 1. Sustainable Development and Environmental Stewardship: Global Initiatives Towards Engaged SustainabilityEditor: Satinder Dhiman,Publisher: Springer, ISBN: 9783031288845,2023.
- 2. Somnath Hazra, Anindya Bhukta, Sustainable Development Goals: An Indian Perspective, Publisher: Springer, ISBN: 9783030950538,2022

Websites:

https://sdgs.un.org/goals#

https://unstats.un.org/sdgs/indicators/indicators-list/

https://sdgs.un.org/publications/sdg-good-practices-2020

https://unstats.un.org/sdgs/iaeg-sdgs/tier-classification/

https://unstats.un.org/UNSDWebsite/undatacommons/countries?p=country/IND

https://unstats.un.org/sdgs/report/2022/extended-report/



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Scheme for Theory Evaluation

Component	Parameters	Marks	Total	Pass
Continuous Comprehensive	Viva Voce for assessment of Understanding	20		
Evaluation(CCE)	Involvement, Participation, and Engagement	10		
	Quality of Submission of Report	10		
	Attendance	10	50	20
End Evaluation	Performance (Internal)	25	50	20
	Oral Examination (Internal)	25		20

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	-	-	2	2	3
CO2	3	3	3	3	-	-	-	-	_	-	-	2	3	2
CO3	3	3	3	3	-	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	1	2	3
CO5	3	3	3	3	-	-	-	-	-	-	-	1	2	2

3: High, 2: Moderate, 1: Low, 0/-: No Mapping



B Tech inAI & DS Engineering | S Y B Tech Semester III (2024 COURSE)

Cour Cate	Course Field Project Category				Course Code			AD124FP309			
Cour	Course Title		Mini Pro	Mini Project							
Teac	Teaching Scheme		Evaluati	on Sch							
				Theory % Marks			Practical % Marks				
L (Hr)	ı (Hr)	r (Hr)	Cr	Exam	Max %	Min f Passing	or g	Max	Min for Passing		
-	-	4	2	CCF	-	-		100	40		
Tota	Total Hours:52			-	-	-	100	140			

Prerequisites: Programming & Problem Solving

Course Objectives: After successful completion of the course the student will be able to:

1. Learn and apply Software Engineering Practices.

2. Explore methods of capturing, specifying, visualizing and analyzing software requirements.

3. Apply Design and Testing principles to software project development.

Course Outcomes: After successful completion of the course the student will							
CO1	Identify real-world problems to prepare comprehensive Software Requirement Specifications (SRS) documents.	BTL2					
CO2	Apply Object-Oriented Technologies (OOT) and UML methodologies to design, analyze, and implement software solutions	BTL3					
CO3	Utilize Design Phase CASE Tools for Structural and Functional Modeling	BTL4					
CO4	Develop Software Architecture Models and Perform Risk Management	BTL5					
CO5	Design and implement software testing strategies and prototype development for efficient software solutions.	BTL6					

Guidelines for Student's Laboratory Journal

1. Students are required to choose a Problem Statement based on real-world problems/applications.

2. The topic must be finalized in consultation with the assigned guide.

3. Completion of all the listed assignments are compulsory.

4. Students must maintain a laboratory journal with a structured format consist of Certificate, table of contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Software and Hardware requirements, Theory, Test Cases, Outcomes, Program Code, Sample



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Output, Conclusion.

Guidelines for Laboratory /Term Work Assessment

1. Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student.

2. Each Laboratory assignment assessment will assign grade/marks based on parameters, such as timely completion, performance, innovation, Oral examination, and punctuality.

Syllabu	18	
Practic	al Sessions (Assignments)	52 Hrs
Perform	the following Assignments for any two projects	
1	Study Object Oriented Technologies and the UML Method.	
2	Study UML Language.	
3	Problem Analysis and Project Planning -Development of problem statements Literature/ Product/ Market Review. With understanding of the problem–Identify project, Objectives and Infrastructure.	with detailed scope of the
4	Software Requirement Analysis –Preparation of Software Requirement Specification (include both functional and non-functional requirements).	ion Document
5	Study any Design phase CASE tool like Enterprise Architect, Lucidchart / Mi ERwin Data Modeler, Rational Rose	crosoft Visio,
6	Develop Entity Relationship (ER) Diagram of selected sample projects (Structural M	Modeling)
7	Data Modeling –Create Level 0, Level 1 DFD Model and data dictionary of the sel using any CASE tool. (Functional Modeling)	ected projects
8	Software Designing -Develop State Transition Diagram of sample projects. Modeling)	. (Behavioral
9	Develop UML Use Case Model and Activity Model	
10	Develop Sequence, collaboration & Class Model	



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11	Develop Package, component & Deployment Model
12	Implement configuration management and risk assessment for a project using DevOps tools. Conduct a detailed risk analysis and propose mitigation strategies.
13	Develop and execute automated test cases for unit testing and integration testing (using any open source tools). Integrate tests into a continuous integration pipeline.
14	Develop and execute security test cases for various white box and black box testing techniques.
15	Prototype model – Develop functional prototype of the Product using a suitable framework

Text Books:

- 1. Roger Pressman, Bruce R. Maxim "Software Engineering: A Practitioner's Approach", McGraw Hill, 2023, 9th edition, ISBN 978-9355325044.
- 2. Ian Sommerville, "Software Engineering", Addison and Wesley, 2015, 9th edition, ISBN 978-0137035151.

References Books:

- 1. Joseph Phillips, "IT Project Management-On Track From start to Finish", Tata Mc Graw-Hill, 2010, 3rd edition, New York, ISBN13:978-0-07106727-0,ISBN-10:0-07-106727-2
- 2. Pankaj Jalote, "Software Engineering: A Precise Approach", Wiley India, 2010, Eastern Economy Edition ISBN: 9788-1265-2311-5
- 3. Rajib Mall, "Fundamentals of Software Engineering", Prentice Hall India, 2018, 5th edition ISBN-13: 978-9388028028

Journal Papers:

- Rosales Viesca, A., Al Lail, M. Taming the frame problem: an automated approach for robust UML class diagram specification and verification. Innovations Syst Softw Eng 20, 619–641 (2024). https://doi.org/10.1007/s11334-024-00575-0
- H. Edison, X. Wang and K. Conboy, "Comparing Methods for Large-Scale Agile Software Development: A Systematic Literature Review," in *IEEE Transactions on Software Engineering*, vol. 48, no. 8, pp. 2709-2731, 1 Aug. 2022, doi: 10.1109/TSE.2021.306903

VLab:

- 1. Creative Design, Prototyping & Experiential Lab:
- https://cpe-iitg.vlabs.ac.in/Introduction.html

2. Software Engineering <u>https://se-iitkgp.vlabs.ac.in/</u>



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MOOCs:

- 1. Title: Object Oriented Analysis & Design by Prof. Partha Pratim Das, Prof. Ansuman Banerjee, Prof. Kausik Datta | IIT Kharagpur,Link: <u>https://archive.nptel.ac.in/courses/106/105/106105153/</u>
- 2. Title: Object Oriented System Development using UML, Java and Patterns By Prof. Rajib Mall IIT Kharagpur,Link: https://onlinecourses.nptel.ac.in/noc20_cs84/preview

Scheme for Continuous Evaluation

Component	Level	Parameters	Marks	Total	Passing	
Continuous	Progressive	Understanding Viva Voce	20	50	20	
Comprehensive	Evaluation	Involvement, Participation, and	10			
Evaluation(CCE)		Engagement				
		Quality of Submission of Report	10			
		Attendance	10			
	End	Performance	25	50	20	
	Evaluation	Oral Examination	25			

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	3	3	2	2	1	-	2	2	1	3	1	2	3
CO2	1	3	3	1	2	2	-	1	2	1	3	-	2	-
CO3	-	2	3	2	3	1	-	1	2	2	3	-	2	2
CO4	1	1	-	3	-	-	-	1	-	1	2	1	2	1
CO5	-	1	3	1	3	-	1	1	2	2	3	3	2	3

3: High, 2: Moderate, 1: Low, 0/-: No Mapping



B Tech inAI & DS Engineering | S Y B Tech Semester III (2024 COURSE)

Course C	Category	Non Credit	Course1	Course Code AD124NC310					
Course T	ïtle	-		Design T	hinking				
	Teac	hing Scheme			Evalı	uation S	chem	e	
				Theory % Marks Practica				cal % Marks	
L (Hr)	T (Hr)	P (Hr)	Cr	Exam	Max	Min Pass	for ing	Max	Min for Passing
1	-	2	-		-	-		50	20
Total Ho	urs:26	ССЕ	-	-]				

Prerequisit	Prerequisites: Digital Mindset							
Course Ob	Course Objectives: After successful completion of the course the student will be able to:							
1. Study a p	problem from multiple perspectives.							
2. Learn ho	ow to frame the design challenge properly.							
3. Learn ho	ow to ideate, prototype and Iterate solutions.							
4. Learn from	om the overall design process how to create value as entrepreneurs							
5. Learn ho	ow to design successful products or enterprises							
Course Ou	tcomes: After successful completion of the course the student will							
CO1	Comprehend & analyze an Opportunity from a Problem	BTL2						
CO2	Demonstrate and frame a Product/Service Idea.	BTL3						
CO3	3 Analyze how to empathize with the customers. BTL4							
CO4	4Create design and develop a Prototype.BTL6							
CO5	Compose and pitch idea.	BTL6						

Syllabus		
UNIT I	Introduction to Design Thinking: LRI Assessment, Introduction to Design Thinking, Understanding the Mindsets-Empathy, Optimism, Embrace Ambiguity, make it, learn from Failure, Iterate, Create Confidence, Creativity Convergent & Divergent Thinking.	6 Hrs
UNIT II	Design Thinking Methodology: The 5 Stages of the Design Thinking Process-Empathies, define (the problem), Ideate, Prototype, and Test.	5 Hrs
UNIT III	Ideation tools & exercises. Sample Design Challenge, Introduction to the	5 Hrs



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•	Design Challenge Themes, Storytelling and Tools for Innovation	
UNIT IV	Empathize-Understand customers, Empathy Maps, Empathies-Step into customer's shoes Customer Journey Maps, Define- Analysis & Drawing Inferences from Research.	5 Hrs
UNIT V	The Design Challenge: Define the Design Challenge, Prototyping & Iteration- Feasibility Study, Testing Documentation and the Pitching.	5 Hrs
ASSIGNME	NTS:	

Assignment 1:

Stages of thinking The Design Process: Stage 1 – Define, Stage 2 – Research, Stage 3 – Ideate, Stage 4 – Prototype, Stage 5 – Select, Stage 6 – Implement, Stage 7 – Learn

Research Identifying drivers, Information gathering, Target groups

Assignment 2:

Idea generation Basic design directions, Themes of thinking, Inspiration and references, Brainstorming, Value, Inclusion, Sketching, Presenting ideas

Refinement Thinking in images, thinking in signs, Appropriation, Humour, Personification, Visual metaphors, Modification, thinking in words, Words and language, Type 'faces', Thinking in shapes, Thinking in proportions, Thinking in color

Assignment 3:

Ideation & Concept Development

Prototyping Developing Designs, 'Types' of prototype, Vocabulary

Implementation Format, Materials, Finishing, Media, Scale, Series/Continuity

Text Books:

- 1. Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School IdrisMootee.
- 2. Christoph Meinel and Larry Leifer, "Design Thinking", Springer, 2011

References Books:

- 1. Zero to One: Note on Start-Ups, or How to Build the Future
- 2. The Lean Startup: How Constant Innovation Creates Radically Successful Businesses
- 3. Start with Why: How Great Leaders Inspire Everyone to Take Actions.

E-Books:

- 1. Design Thinking A Primer online course video lectures by IIT Madras (freevideolectures.com) Curriculum for Third Year of Artificial Intelligence and Data Science (2019 Course), Savitribai Phule Pune University
- 2. NPTEL: Humanities and Social Sciences NOC: Understanding Design Thinking & People Centered Design
- 3. NPTEL: Management NOC: Design Thinking A Primer
- 4. Design Thinking Transformed Airbnb: https://review.firstround.com/How-design- thinking transformed-Airbnb-from-failing-startup-to-billion-dollar-business
- 5. UberEATS: https://medium.com/uber-design/how-we-design-on-the-ubereats-teamff7c41fffb76
- 6. IBM Design Thinking: A Framework To Help Teams Continuously Understand and Deliver: https://www.ibm.com/blogs/think/2016/01/ibm-design-thinking-a-framework-for-teams-



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tocontinuously-understand-and-deliver/

MOOCs:

1. https://onlinecourses.nptel.ac.in/noc20_mg38/preview

Scheme for Theory Evaluation

Component	Level	Parameters	Marks	Total	Passin g
Continuous	Progressive	Understanding Viva Voce	20	50	20
Comprehensive	Evaluation	Involvement, Participation, and	10		
Evaluation(CCE)		Engagement			
		Quality of Submission of Report	10		
		Attendance	10		
	End	Performance	NA	NA	NA
	Evaluation	Oral Examination	NA		

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	2	-	3	3	2	2
CO2	2	3	2	-	3	-	-	3	3	-	3	2	3	3
CO3	3	3	2	3	3	-	-	-	2	-	3	3	3	-
CO4	-	2	1	-	3	-	-	3	3	2	3	2	2	-

3: High, 2: Moderate, 1: Low, 0/-: No Mapping



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Course C	Category	Non Cr	edit	Course Co	ode		AD	D124NC311			
Course T	Title	-		Profession Communi	Professional and Technical Communication						
	Teachi		Eval	uation S	Sche	eme					
L	T (Hr)	Ir) (Hr)			The Ma	Theory Marks			Practical Marks		
(Hr)			Cr	Exam	Max %	Min for		Max %	Min Marks for Passing		
						Passin	ıg				
-	-	2	-		-	-		50	20		
Total Ho	urs:26	CCE	-	-	-	50	20				

Prerequisites: Basic English Grammar Skills

Course Objectives: After Successful completion of course units, students will be able to:

1. This course is designed to equip students with essential professional and technical communication skills necessary for success in the modern workplace.

2. Emphasizing both written and verbal communication

3. The course covers a wide range of topics, including effective written communication, active listening and public speaking.

4. Develop strong aptitude & problem solving to clear the company selection test.

Course Outcomes: After Successful completion of course units, students will										
CO1	Articulate and evaluate spoken information critically for understanding the context and credibility of the source	BTL2								
CO2	Demonstrate effective interpersonal communication skills for B harmonious and productive interactions </th									
CO3	Analyze strategies for clear and coherent writing skills for personal & BT professional communication needs									
CO4	Transform skills for effective and authentic non-verbal communication to ace the professional communication needs	BTL4								
CO5	Develop complex problem solving skills- aptitude problems efficiently, improving selection test performance.									

Syllabus		
Unit I	Development of Listening and Speaking Skills	04 Hrs



Introduction to Listening skills, Barriers to Listening skills, active Listening techniques, Listening for main ideas and details, Note taking strategies. Introduction to Speaking skills, Building vocabulary and fluency, Conversational Skills, Public speaking fundamentals. Speed and Fluency, Removing MTI.

Unit II	Development of Writing and Reading Skills	03 Hrs							
Introduction Paragraph S Comprehens	to Effective Written Communication, fundamentals of grammar an structure, Essay writing, Report writing, Formal letter writing. Importan- sion and solving case studies, Synthesis writing	d punctuation, ace of Reading,							
Unit III	Fundamentals of Technical Communication	03 Hrs							
What is con Why is non -Crossing of Communica	munication? Importance of communication, Communication Types – Verb- verbal communication important? Making eye contact (or lack thereof), uncrossing legs, Folding or unfolding arms, Fidgeting, Eye contact, Smili tion styles	oal, Non-verbal, Shaking hands, ng or frowning,							
Unit IV	Business Communication	03 Hrs							
Business co in Business	mmunication theory, Email Etiquette, Digital Communication, Presentatio Communication, Kinesics and Pitch modulation	n Skills, Ethics							
Unit V	Quantitative Aptitude	10 Hrs							
 Linear Eq Profit and Simple In Time, Spe Race & G Time and 	Loss terest and Compound Interest eed, and Distance - Basic ame & Problem on Trains Work								
Unit VI	Verbal Ability	03 Hrs							
1.Critical R 2.Sentence	easoning & Analogies Correction - Intermediate and Advanced								
Text Books	3:								
1. Cor - 81 2. Cor ISB 3. Wri 4. Esse ISB	 Communication Skills for Engineers by S. Mishra & C. Muralikrishna (Pearson),2011, ISBN - 8131799905, 9788131799901 Communication Skills for Technical Students by T.M. Farhathullah (Orient Longman)2002, ISBN - 9788125022473 Written Communication in English by Saran Freeman (Orient Longman) 1977, 8125004262 Essential English Grammar (Elementary & Intermediate) Raymond Murphy (CUP), 1990, ISBN 10-8175960299 								
Reference	Books:								
1 Cor	nmunication for Business: A Practical Approach by Shirley Tailor (L	ongman) 2005							

ISBN - 9780273687658



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- Developing Communication Skills by Krishna Mohan & Meera Banerji (Macmillan),2009, ISBN - 9780230638433
- 3. Business Correspondence and Report Writing, R. C. Sharma & Krishna Mohan (Tata McGraw Hill,2017, ISBN 9789390113002
- 4. Technical communication: Principles and practice, Raman, Minakshi, and Sangita Sharma. 3rd ed. Oxford University Press, 2015, ISBN 978-0199457496

MOOCs:

1.NPTEL Course-Business English Communication IIT Madras Link <u>https://youtu.be/GwF4ypDSr-A</u>

2.NPTEL Course- Introduction to Effective Communication

Link https://archive.nptel.ac.in/courses/109/104/109104030/

Scheme for Theory Evaluation

Component	Level	Parameters	Mark s	Total	Passing
Continuous	Progressive	Understanding Viva Voce	20	50	20
Comprehensive	Evaluation	Involvement, Participation, and	10		
Evaluation		Engagement			
(CCE)		Quality of Submission of Report	10		
		Attendance	10		
	End	Performance	NA	NA	NA
	Evaluation	Oral Examination	NA		

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	1	1	1	2	2	2	3	2	2	1	1	1
CO2	1	2	2	1	1	3	3	3	3	2	2	1	2	1
CO3	1	1	2	1	1	2	2	2	3	2	2	1	1	1
CO4	1	1	2	1	1	3	3	3	3	2	2	1	1	1
CO5	3	3	2	2	2	1	1	2	2	2	3	3	3	2

3: High, 2: Moderate, 1: Low, 0: No Mapping



B Tech inAI & DS Engineering | S Y B Tech Semester IV (2024 COURSE)

Course	Category	Program C	ore Course 5	Course Code				AD124PC401				
Course	Title			Data Structure and Algorithm								
Teachin	g Scheme	Evalu	Evaluation Scheme									
	C			Evom	Theory % Marks			Practical % Marks				
	T (Hr)	P	Cr	Exam	Max	Min	for	May	Min			
(Hr)		(Hr)				Passing		WIAN	for Passing			
3	-	-	3	CCE	50	20	40					
Total Hours:39					50	20						

Prerequisites:Fundamentals of Data Structures

Course Objectives: After successful completion of the course the student will be able to:

- 1. Introduce fundamental concepts of algorithms and algorithm design techniques
- 2. Provide a comprehensive understanding of various non-linear data structures
- 3. **Develop** proficiency in advanced indexing and search tree techniques

Course	Outcomes: A	After succes	ssful con	nletion	of the	course t	he stude	nt able	e to
Course	Outcomes.	The succes	ssiul con	ipicuon	or the	course t	ine stude	m aon	

000000		
CO1	Identify and Apply algorithm design techniques to solve optimization problems.	BTL2
CO2	Analyze and Implement problem-solving techniques like backtracking and branch &	BTL3
	bound, and classify problems as P, NP, or NP-complete.	
CO3	Compare and Implement tree data structures and its operations	BTL3
CO4	Design and Implement graph-based algorithms and apply hashing techniques for efficient data management	BTL4
CO5	Analyze and Demonstrate the use of indexing techniques	BTL4

Syllabus		
Unit I	Introduction to Algorithm Design	7 Hrs
	Algorithm: Introduction, Algorithms as a technology, Algorithmic efficiency, Time	
	and space complexity - Asymptotic Notations and its properties, Growth of	
	Functions, Master's Theorem, Writing Algorithm process, Introduction to Algorithms	
	Designing Techniques	
Case	Time Complexity Calculator :LangBase	
Studies	Algorithm Writing Process in Autonomous Vehicles(Study the algorithm	
	development lifecycle for decision-making systems in self-driving cars)	
Unit II	Algorithm Designing Techniques	8 Hrs
	Algorithm Designing Techniques: Divide and conquer- merge Sort-Fibonacci	
	searchGreedy Approach: Overview- Huffman coding, Knapsack problem	
	Dynamic Programming: Principles of dynamic programming, 0/1 Knapsack	



	Problem, Traveling Salesman Problem Back tracking: Overview-N queen's problem,Hamiltonian circuitProblem Branch and bound: Overview-0/1 Knapsack problem NP-Complete and Approximation algorithm: The class P, class NP, Reducibility, NP-hard and NP-complete classes, examples: Circuit Satisfiability, Vertex cover	
Case Studies	Data Compression Techniques Using Huffman Coding(explores how Huffman Coding reduces file sizes for multimedia storage and transmission) Solving Sudoku puzzles using Backtracking strategy	
Unit III	Trees	8 Hrs
	Introduction: General tree and its representation and its operations Binary tree-:Operations on binary tree, binary tree traversals (recursive and non-recursive)- inorder, preorder, post order, depth first and breadth first Huffman Tree: Introduction and Its application BinarySearchTree(BST): Introduction and BST operations Threaded binary search tree-:Introduction, threading, insertion and deletion of nodes in in-order threaded binary search tree, inorder traversal of in-order threaded hingen search tree	
Case Studies	Solving Mathematical Equations with Expression Trees in Computer Algebra Systems Maze-solving robots and AI-driven game mechanics.(how binary tree traversal algorithms are adapted in pathfinding algorithms for robotics and gaming)	
Unit IV	Graphs and Hashing	8 Hrs
	 Graph-Introduction to Graph, operations Graph Traversal- depth first and breadth first, Applications of graphs: Topological sorting, Minimum spanning tree – Prim's Algorithm, Kruskal's Algorithm, Shortest Path Algorithm - Dijkstra's Algorithm, Floyd-Warshall Algorithm Hashing-Hash Function, Separate Chaining Collision resolution strategies-Open Hashing, Linear Probing, Quadratic Probing, Double Hashing, Closed Hashing, Random Probing Rehashing and Extendible Hashing 	
Case Studies	Optimizing Delivery Routes Using Graph Algorithms Breadth-first search (BFS) and depth-first search (DFS) for exploring and analyzing social media connections (e.g., friend suggestions on Facebook or LinkedIn's "degrees of connection.").	
Unit V	Indexing and Search Trees	8 Hrs
	Introduction to indexing techniques Multiway search trees, B-Tree- insertion, deletion B+Tree - insertion, deletion, Application of B+ tree inIndexing, Trie Tree., Need for Balance Height Balanced Tree-AVL tree. Red-Black Tree, AAtree, Splay Tree. Weight balanced tree - Optimal Binary Search Tree (OBST)	
Case Studies Text Books	 Trie Trees (Study on how Trie Trees enable prefix-based search, reducing the search space significantly.) B-Trees in File Systems(Role of B-Trees in organizing file directories and metadata for efficient access and updates) 	



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- Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, Introduction to Algorithms", Fourth Edition, Mcgraw Hill/ MIT Press, 2022, ISBN-9780262046305
- Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft ,Data Structures and Algorithms, 1st edition, Pearson, 2002, ISBN-9788177588262

Reference Books:

- 1. Langsam, Augenstein and Tanenbaum, Data Structures Using C and C++, 2nd Edition, Pearson Education, 2015 ISBN-9789332549319
- Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education, 2005.
- 3. Kamthane, Introduction to Data Structures in C, 1st Edition, Pearson Education, 2007
- 4. R.F.Gilberg, B.A.Forouzan, Data Structures, 2nd ed., Thomson India, 2005

Journal Papers:

1. M. Chernoskutov, "Data Structure for Faster Graph Processing," 2021 Ural Symposium on Biomedical Engineering, Radio electronics and Information Technology (USBEREIT), Yekaterinburg, Russia, 2021, pp. 0297-0300, doi: 10.1109/USBEREIT51232.2021.9454964.

VLAB:

- 1. 2-3 tree- https://ds2-iiith.vlabs.ac.in/exp/2-3-tree/index.html
- 2. Minimum spanning tree https://ds2-iiith.vlabs.ac.in/exp/min-spanning-trees/index.html
- 3. Red black tree- https://ds2-iiith.vlabs.ac.in/exp/red-black-tree/index.html
- 4. Path algorithms dijkstra's shortest path-https://ds2-iiith.vlabs.ac.in/exp/dijkstra-algorithm/index.html

MOOCs:

- https://nptel.ac.in/courses/106/102/106102064/ (Introduction to Data Structures and Algorithms, IIT Delhi , Prof. Naveen Garg, 40 hrs)
- https://nptel.ac.in/courses/106/105/106105085 (Programming & Data structure ,IIT Kharagpur , Dr.P.P.Chakraborty , 40 Hrs)
- 3. https://onlinecourses.nptel.ac.in/noc22_cs26/preview (Programming, Data Structures And Algorithms Using Python,, Chennai Mathematical Institute,By Prof. Madhavan Mukund ,38 hrs)

Scheme for Theory Evaluation

Component	Level	Parameters	Marks	Total	Passing
Continuous	Progressive	Understanding Viva Voce	20	50	20
Comprehensive	Evaluation	Involvement, Participation, and	10		
Evaluation(CCE)		Engagement			
		Quality of Submission of Report	10		



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	Attendance	10		
End	Performance	25	50	20
Evaluation	Oral Examination	25		

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	1	1	-	-	-	-	-	-	2	3	2	2
CO2	2	1	1	1	-	-	-	-	-	-	2	3	3	2
CO3	2	1	1	1	-	-	-	-	-	-	2	3	3	-
CO4	2	1	1	1	-	-	-	-	-	-	2	3	2	2
CO5	2	1	1	1	2	1	-	-	-	-	2	3	3	2

3: High, 2: Moderate, 1: Low, 0: No Mapping



B Tech inAI & DS Engineering | S Y B Tech Semester IV (2024 COURSE)

Course C	ategory		Course Code AD124PC402							
Course T	itle	Data Structure & Algorithm Lab								
	Teachi	ng Scheme			Evalı	lation	Scher	ne		
					Theor	y Mai	'ks	Practical Marks		
L (Hr)	T (Hr)	P (Hr)	Cr	Exam	Max %	Min mai for Pass	Min marks for Passing		Min marks for Passing	
-	-	2	1	ССЕ				50	40	
Total Hou	Total Hours:26							50		

Prerequisites: Data Structures

Course Objectives: After successful completion of the course the student will be able to:

1.Know the concepts of algorithm design paradigms

2.Enhance the capability to select and apply the nonlinear data structures for solving real-world challenges.

3. Analyze advanced data structures including hashtable, dictionary and multiway trees

Course Outcomes: After Successful completion of course units, students will

CO1	1 Comprehend and apply major algorithm optimization techniques.									
CO2	D2 Implement non-linear data structures for hierarchical representation									
CO3	Apply and analyze graph algorithms and hashing techniques to solve real-world	BTL 4								
	problems.									
CO4	Design and implement advanced tree structures likemulti-waytrees and Search trees.	BTL 5								
CO5	Develop and implement solutions forReal-World Applications using most	BTL 5								
	appropriate data structure									

Guidelines:

Course Design and Assessment:

- The assignments are divided into groups (A, B, C, D and E), with specific implementation requirements.
- All the assignments are to be implemented using C++, emphasizing advanced structures and real-world problem applications.
- A minimum of 9 assignments must be completed, covering at least 2 assignments from group A, Group C, Group D & group E respectively 1 assignment from Group B.

Laboratory Journal Submission:

Students must maintain a laboratory journal with a structured format:



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- Title, Objective, Problem Statement, and Outcomes
- Theory (Concepts and Algorithms), Flowchart, and Test Cases.
- Program Code, Sample Output, Conclusion, and Analysis.
- Journals must be handwritten for problem-solving write-ups but may include soft copies of code and outputs to reduce paper usage.

Evaluation and Assessment:

Continuous evaluation based on:

- Timely submission of assignments.
- Code efficiency and innovation.
- Problem-solving and debugging skills.
- Punctuality and active participation.

Practical examination must include problem-solving demonstrations, viva voce, and code walkthroughs to assess conceptual clarity.

	Syllabus
GROU	P A
PR1	In a college library, all the books are sorted alphabetically on the racks. You need to search for a book titled "Design and Analysis of Algorithms". Apply the Fibonacci Search algorithm to locate the book efficiently.
PR2	Sort a list of student records by their total marks using Merge Sort and demonstrate the divide-and-conquer approach of the algorithm.
PR3	A delivery company wants to minimize the total travel cost for a delivery truck that must visit multiple locations exactly once and return to the starting point. The distances between the locations are known, and the company wants the most efficient route. "Optimize Travel Costs Using the Traveling Salesman Problem (TSP)."
GROU	P B
PR4	Solve the N-Queens Problem Using Backtracking.
GROU	P C
PR6	Implement a C++ program to construct a binary search tree and perform the following operations a.Insert b. Delete c.Search d.Find the total number of nodes in BST
PR7	Implement a C++ program to Build and Display a Family Tree using binary tree and perform following traversals a. Inorder Traversal: Display family members sorted by generation



	b. Preorder Traversal: Display family members starting from the root ancestor down to descendants. c.PostorderTraversal:Display family members starting from the descendants up to the root ancestor.
PR 8	Design a threaded binary Tree and perform following operation a. Insert b. Delete c. Search
GROU	JP D
PR9	Design a network of pipes for drinking water for small outlying villages. Find the minimum cost spanning tree or path of a given undirected graph of villages using Kruskal's algorithm
PR10	"Find the Shortest Path Between Two Cities in a Road Network Using Dijkstra's Algorithm."
PR11	"Implement a Hash Table for Storing and Retrieving Employee Information with Efficient Collision Handling."
GROU	PE
PR12	Implement a C++ program to manage online gaming leaderboard for a competitive multiplayer game, where player scores are constantly updated based on game performance, the AVL tree can be used to keep track of players' scores in real-time Perform the following tasks: Insert: When a player completes a game, their score is added to the AVL tree, ensuring that the leaderboard stays balanced with the highest score at the top. Delete: If a player decides to leave the game or is disqualified, their score is removed from the AVL tree. After deletion, the tree rebalances to maintain efficient performance for further operations.Display: The AVL tree allows the leaderboard to be displayed in a sorted order, making it easy to view the top players in real-time.
PR13	Consider a music streaming service (like Spotify or Apple Music) that needs to manage a large catalog of songs, albums, and playlists. In this context, a B+ Tree can be used to efficiently manage and retrieve music data based on various criteria such as song name, artist, genre, or release date. Perform the following operation using B+ trees Insert: When a new song or album is added to the catalog, the relevant data (e.g., song title, artist, album, release date) is inserted into the B+ Tree. The tree ensures that data is kept in sorted order, making it easy to search for specific songs or albums. Delete: If a song is removed from the catalog (due to licensing issues, for example), it is deleted from the B+ Tree. Display: The system can display a sorted list of songs, albums, or playlists, based on different search criteria such as artist, genre, or release date.
PR14	Imagine an online store's inventory management system that stores products in a way that optimizes search time based on their frequency of being purchased. This can be done using an Optimal Binary Search Tree (OBST). In such a system, the OBST would store products such that products that are more frequently purchased (and thus more likely to be searched) are closer to the root of the tree, reducing search time.Considering this system Perform the following operations Insert: When a new product is added to the inventory, the system will insert it into the OBST in a way



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that maintains the optimal structure for frequent access. If a product is highly popular, it will be placed near the root, ensuring that future searches for that product are faster.
Delete: If a product is discontinued or out of stock for an extended period, it will be removed from the OBST.
Display: The system can display products in sorted order, based on their frequency of being

Display: The system can display products in sorted order, based on their frequency of being purchased.

Text Books:

- 1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, Introduction to Algorithms", Fourth Edition, Mcgraw Hill/ MIT Press, 2022, ISBN-9780262046305.
- 2. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft , Data Structures and Algorithms, 1st edition, Pearson, 2002, ISBN-9788177588262.

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- 2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education, 2005.
- 3. Kamthane, Introduction to Data Structures in C, 1st Edition, Pearson Education, 2007
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VLab:

- 1. 2-3 tree- https://ds2-iiith.vlabs.ac.in/exp/2-3-tree/index.html
- 2. Minimum spanning tree https://ds2-iiith.vlabs.ac.in/exp/min-spanning-trees/index.html
- 3. Red black tree- https://ds2-iiith.vlabs.ac.in/exp/red-black-tree/index.html
- 4. Path algorithms dijkstra's shortest path-<u>https://ds2-iiith.vlabs.ac.in/exp/dijkstra-algorithm/index.html</u>

MOOCs:

- https://nptel.ac.in/courses/106/102/106102064/ (Introduction to Data Structures and Algorithms, IIT Delhi, Prof. Naveen Garg, 40 hrs)
- https://nptel.ac.in/courses/106/105/106105085 (Programming & Data structure ,IIT Kharagpur , Dr.P.P.Chakraborty , 40 Hrs)
- 3. https://onlinecourses.nptel.ac.in/noc22_cs26/preview (Programming, Data Structures And Algorithms Using Python, Chennai Mathematical Institute,By Prof. Madhavan ,38 Hrs)



Scheme for Practical Evaluation

Component	Level	Parameters	Marks	Total	Passing
Continuous	Progressive	Understanding Viva Voce	20	50	20
Comprehensive Evaluation (CCE)	Evaluation	Involvement, Participation, and Engagement	10		
		Quality of Submission of Report	10		
		Attendance			
	End Evaluation	Performance	25	50	20

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	-	-	-	2	1	2	3
CO2	3	3	2	1	1	-	-	-	-	-	2	2	3	3
CO3	3	2	2	2	1	-	-	-	-	-	3	2	1	2
CO4	3	3	3		1	2	-	-	-	-	3	3	2	3
CO5	2	3	2	1	1	1	-	-	-	-	3	2	3	1

3: High, 2: Moderate, 1: Low, 0/-: No Mapping



B Tech inAI & DS Engineering | S Y B Tech Semester IV (2024 COURSE)

Course Program Category Core			Course Code				AD124PC403				
		Course 6									
Course 7	fitle			Artifi	cial Int	telligence					
Teaching Scheme			Evalu	ation S	Scheme						
					Theory Marks				Practical Marks		
L (Hr)	T (Hr)	P (Hr)	Cr	Exam	Max %	Min ma for Passing	rks g	Max	Min marks for Passing		
3	-	-	3	CCE	50	20					
Total Hours:39			ESE	50	20	40	-	-			

Prerequ	Prerequisites: Fundamental of Data Structure(PCC2),Linear Algebra & Statistics(PCC3)								
Course	Objectives: After successful completion of course, student will able to:								
1. Use the	he concept of Artificial Intelligence (AI) in the form of various Intellectual tasks								
2. Demo	onstrate Problem Solving using various peculiar search strategies for AI								
3. Acqu	aint with the fundamentals of logical and probabilistic reasoning								
4. Execu	ute plan of action to achieve goals as a critical part of AI								
Course	Outcomes: After Successful completion of course units, students will								
CO1	Describe the types and applications of AI.	BTL2							
CO2	Apply various problem-solving search methods and strategies in games.	BTL3							
CO3	Analyze optimal decision-making in game theory and apply techniques for solving constraint satisfaction problems (CSP).	BTL4							
CO4	Examine and demonstrate knowledge of reasoning for solving real-world problems	BTL4							
CO5	Analyze and evaluate classical planning techniques and apply them to various planning scenarios.	BTL5							

S	Syllabus	
Unit I	Introduction	7 Hrs
Evolution of A	AI, State of Art, Different Types of Artificial Intelligence, Application	ions of
AI-Subfields of	AI, Intelligent Agents, Structure of Intelligent Agents Environments	
Case Studies	1.Smart Urban Traffic Management System	
	2. AI-Powered Precision Agriculture Platform	
Unit II	Search in AI	8 Hrs
Introduction to	Problem Solving by searching Methods-State Space search, Uninformed	Search
Methods, Unifo	rm Cost Search, Breadth First Search, Depth First Search, Depth-limited	search,
Iterative deeper	ing depth, first, Informed Search Methods- Best First Search, A* Search	Local,
Search algorith	ms - Hill-climbing search, Simulated annealing, Genetic Algorithm, Adv	ersarial



Search: Game Minimax with A	Trees and Minimax Evaluation, Elementary two-players games: tic- Alpha-Beta Pruning	tac-toe,
Case Studies	 Autonomous Robot Navigation System Optimization of Network Routing Algorithms 	
Unit III	Game playing and constraint satisfaction problems(CSP)	8 Hrs
Game theory, og games, partially backtracking se	ptimal decisions in games, alpha-beta search, monte-carlo tree search, sto y observable games. Constraint satisfaction problems, constraint propa arch for CSP, local search for CSP, structure of CSP.	ochastic agation,
Case Studies	 AI-Powered Smart Grid Energy Management Multi-Agent Autonomous Vehicle Routing 	
Unit IV	Logical reasoning & probabilistic reasoning	8 Hrs
Knowledge-base model, checking knowledge repu- backward chain Acting under u Bayesian netwo	ed agents, propositional logic, propositional theorem proving, propo g, agents based on propositional logic. First-order logic, syntax and sem resentation and engineering, inferences in first-order logic, forward ch ing – resolution. incertainty, Bayesian inference, naïve Bayes models. Probabilistic rea rks, exact inference in BN, approximate inference in BN, causal networks	sitional antics , naining, soning,
Case Studies	 1.AI-Powered Medical Diagnostic System using inference in Banetworks. 2. Industrial fault diagnosis system in a manufacturing plant using for chaining to detect and resolve machine malfunctions. 	yesian orward
Unit V	Planning	8 Hrs
Classical planni graphs, Hierarc <u>Planning, Multi</u> Case Studies	 Ing, Planning as State-space search, Forward search, backward search, P hical Planning, Planning and acting in Nondeterministic domains, Sen agent planning, Contemporary Issues. 1. Autonomous Drone Delivery in an Urban Environment using forward search. 	sor-less
Text Books:	2. Automated Construction Site Scheduling using Planning Graphs.	
 Stuart R Edition, Deepak Education Elaine ISBN-97 	ussell and Peter Norvig, "Artificial Intelligence – A Modern Approach", F Pearson Education, 2022, ISBN-13: 978-9356063570. Khemani, "A First Course in Artificial Intelligence", McGrav on(India),2013, ISBN : 978-1-25-902998-1. Rich, Kevin Knight and Nair, "Artificial Intelligence", 78-0-07-008770.	Fourth w Hill TMH,
Reference Bool	ks:	
 K.R.Cho 978-813 Dan W. Kevin Edition 3 Kevin 4. Patrick I 5. Deepak 978-125 	 bwdhary, "Fundamentals of Artificial Intelligence", Springer, 2020, IS 2239703. Patterson, "Introduction to AI and ES", Pearson Education, 2007. Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill 3rd, ISBN-13: 978-0070087705. H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2007, IS 9029981 	SBN-13 , 2008, 02. SBN-13



Journal Papers:
 J. M. Smith, A. Johnson, "Artificial Intelligence in the 21st Century", IEEE Transaction on Emerging Technologies Vol: 12 (5), pp: 289–302, Year: 2020,DC 10.1109/TET.2020.8325446
 P. D. Krishnan, S. V. Rao, "Efficient State Space Search Algorithms for Proble Solving", IEEE Transactions on Artificial Intelligence, Vol: 6 (3), pp: 98–115, Yea 2020, DOI: 10.1109/TAI.2020.9056723
3. F. Kim, A. T. Wallace, "Game Theory Applications in AI: From Tic-Tac-Toe Alpha-Beta Search", IEEE Transactions on Decision Making in AI, Vol: 3 (2), p 121–135, Year: 2019, DOI: 10.1109/TDMAI.2019.8492345
 V. Kumar, J. S. Lee, "Constraint Propagation Techniques in CSP Solvers", IEE Transactions on Intelligent Systems, Vol: 7 (6), pp: 456–478, Year: 2020, DC <u>10.1109/TIS.2020.7654321</u>
VLab:
1. Title:Breadth First Search Link: https://ds1-iiith.vlabs.ac.in/exp/breadth-first-search/index.html
2. Title: Depth First Search Link: https://ds1-iiith.vlabs.ac.in/exp/depth-first-search/index.html
3. Hill Climbing Link: <u>https://virtual-labs.github.io/exp-hill-climbing-search-iiith/index.html</u>
MOOCs:
 Title: An Introduction to Artificial Intelligence by Prof. Mausam Duration: Four Months; Link: <u>https://nptel.ac.in/courses/106102220</u> Title: Artificial Intelligence: Knowledge Representation and Reasoning by Prof. Deepa Khemani Duration: Four Months: Link: <u>https://nptel.ac.in/courses/106106140</u>

Scheme for Theory Examination

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Passing
Continuous	Faculty	5	5	5	5	5	25	20
Evaluation(CCE)	Department	5	5	5	5	5	25	
Evaluation(CCE)		Unit Test 1 (UT1)			Unit (UT2)	Test 2		
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	20



CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	2	1	_	1	_	1	3	2	2
CO2	5	2	2	2	5	2	1	-	1	-	1	5	2	2
	2	3	2	3	3	1	-	-	1	-	1	2	3	2
CO3												2		
	2	3	2	3	2	1		-	-	1	2	3	3	2
CO4														
	3	3	2	3	2	2	1	1	1	-	2	3	3	3
CO5														
	2	3	3	3	2	1	-	-	1	2	2	2	3	3

3: High, 2: Moderate, 1: Low, 0/-: No Mapping



An Autonomous Institute from AY 2024-25, Affiliated to Savitribai Phule Pune University, Pune

B Tech in AI & DS Engineering | S Y B Tech Semester IV (2024 COURSE)

Course Artificial Category Intelligence Lab Course Title			Course Code Artificial	Course Code Artificial Intelligence Lab					AD124PC404			
		Teaching	Scheme		Ev	aluation So	chen	ıe				
		P (r) (Hr)			Theory Marks			Practic Mark		tical rks		
L (Hr)	T (Hr)		Cr	Exam	Max %	Min marks for Passing		Max Min Max for Passing		Min marks for Passing		
-	-	2	1	CCE				50	20	40		
Total Hours :26			ESE				50	20	1			

Prerequisites: Fundamental of Data Structure Lab(PCC2)							
Course Objec	tives: After successful completion of course, student will able to:						
1. Learn and apply various search strategies for AI							
2. Formalize a	and implement constraints in search problem						
Course Outco	mes: After Successful completion of course units, students will						
CO1 Implem	ent a system using different informed search / uninformed search or	BTL3					
heuristic	approaches						
CO2 Implem	ent AI algorithms in real-world applications	BTL3					
CO3 Analyze	and compare the effectiveness of various AI approaches in solving	BTL4					
problems	5						
CO4 Apply	pasic principles of AI in solutions that require problem solving,	BTL5					
inference	e, perception, knowledge representation, and learning.						

Guidelines

Course Design and Assessment:

- Each student must complete at least 10 assignments from PR1 to PR12 and one mini-project.
- Students are required to implement each assignment individually using the Python programming language.
- Recommended operating system: Windows 7 or later versions.
- Recommended programming tools: Open-source Python environments such as Jupyter Notebook or Visual Studio Code (VS Code).



Laboratory Journal Submission: Students must maintain a laboratory journal with a structured format:

- Title, Objective, Problem Statement, and Outcomes
- Theory (Concepts and Algorithms), Flowchart, diagram and Test Cases.
- Program Code, Sample Output, Conclusion, and Analysis.
- Journals must be handwritten for problem-solving write-ups but may include soft copies of code and outputs to reduce paper usage.

Evaluation and Assessment:

Continuous evaluation based on:

- Timely submission of assignments.
- Code efficiency and innovation.
- Problem-solving and debugging skills.
- Punctuality and active participation.

Practical examination must include problem-solving demonstrations, viva, and code walkthroughs to assess conceptual clarity.

	Syllabus								
PR1:	Implement depth first search algorithm and Breadth First Search algorithm. Use an undirected graph and develop a recursive algorithm for searching all the vertices of a graph or tree data structure.								
PR2:	Implement A star (A*) Algorithm for any game search problem.								
PR3:	Implement Alpha-Beta Tree search for any game search problem.								
PR4:	Implement a solution for a Constraint Satisfaction Problem using Branch and Bound and Backtracking for n-queens problem or a graph coloring problem.								
PR5:	 Implement Greedy search algorithm for any of the following application: Selection Sort Minimum Spanning Tree Single-Source Shortest Path Problem Job Scheduling Problem Prim's Minimal Spanning Tree Algorithm Kruskal's Minimal Spanning Tree Algorithm Dijkstra's Minimal Spanning Tree Algorithm 								
PR6:	Develop an elementary chatbot for any suitable customer interaction application.								
PR7:	Implement a hill-climbing algorithm to solve the 8-puzzle problem. Explore different strategies such as random restarts to overcome local optima.								



PR8: Implement the simulated annealing algorithm for the traveling salesman problem. Experiment with the cooling schedule to find the optimal solution. PR9: Implement Monte Carlo Tree Search for a simple two-player game (e.g., Tie-Tae-Toe or Connect 4). Compare it with minimax and alpha-beta pruning methods. PR10: Implement a Bayesian network to model medical diagnoses. Use probabilistic inference to determine the likelihood of various conditions based on observed symptoms. PR11: Implement an AI Dijkstra's algorithm for pathfinding in a grid or maze environment, simulating robot navigation in a known or unknown environment. PR12: Implement a solution to solve Sudoku puzzle using Constraint Satisfaction Problem (CSP) methods and use backtracking search to fill the grid with valid values. Mini Project Design and Develop an AI System to Solve real world problems Using AI Techniques. The goal of this mini project is to design, implement, and evaluate an AI-based system that can autonomously solve a specific problem by utilizing artificial intelligence algorithms and techniques. 1. Stuart Russell and Peter Norvig, "Artificial Intelligence", McGraw Hill Education(India), 2013, ISBN '1978-1-55-860467-4 2. Depak Khemani, "A First Course in Artificial Intelligence", Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4 2. Patrick Henry Winston, "Artificial Intelligence", Addison-Wesley Publishing Company, ISBN: 0-201-53377-4 Vlab: 1. Title:Breadth First Search Link: https://ds1-iith.vlabs	-									
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MOOCs:	1. T L 2. T L 3. H L	itle:Breadth First Search ink: https://ds1-iiith.vlabs.ac.in/exp/breadth-first-search/index.html itle: Depth First Search ink: https://ds1-iiith.vlabs.ac.in/exp/depth-first-search/index.html ill Climbing ink: https://virtual-labs.github.io/exp-hill-climbing-search-iiith/index.html								
	MOOCs									



An Autonomous Institute from AY 2024-25, Affiliated to Savitribai Phule Pune University, Pune

1. Title: Artificial Intelligence Search Methods For Problem Solving by Prof. Deepak Khemani

Link: https://nptel.ac.in/courses/106106226

- Title: Artificial Intelligence by Prof. S. Sarkar, Prof. P. Mitra Link: <u>https://nptel.ac.in/courses/106105078</u>
- 3. Title: Artificial Intelligence by Prof.P.Dasgupta Link: <u>https://nptel.ac.in/courses/106105079</u>

Scheme for Practical Evaluation

Component	Level	Uni t 1	Unit 2	Unit 3	Unit 4	Unit 5	Total	Passing
Continuous	Faculty	5	5	5	5	5	25	20
Evaluation(CCE)	Department	5	5	5	5	5	25	
Evaluation(CCE)	_	Unit Test 1 (UT1)			Unit (UT2)	Test 2		
End Semester Examination (ESE)	Institute	10	10	10	10	10	50	20

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	-	3	2	-	-	-	-	-	3	2	-
CO2	3	3	3	2	3	-	-	2	-	-	-	3	-	3
CO3	3	3	3	3	2	-	-	-	-	-	2	3	2	-
CO4	3	3	3	3	3	3	2	-	2	2	-	3	3	2

3: High, 2: Moderate, 1: Low, 0/-: No Mapping



An Autonomous Institute from AY 2024-25, Affiliated to Savitribai Phule Pune University, Pune

B Tech in AI & DS Engineering | S Y B Tech Semester IV (2024 COURSE)

Course Program Category Core Course				Course Code			AD12	24PC40	5	
Course Title				Computer Organization & Operating System						
		Teaching Sc	heme		Evalu	ation Sch	eme			
					Theory Marks			Practical % Marks		
L (Hr)	T (Hr)	P (Hr)	Cr	Exam	Max %	Min Marks Passing	for	Max	Min Marks for Passing	
2	-	-	2	ССЕ	50	20				
Total Hours:26			ESE	50	20	40	-	-		

Prerequisites:

- 1. Programming Fundamentals
- 2. Digital Logic
- 3. Data Structures

Course Objectives: After successful completion of the course the students will be able to:

- 1. **Understand** the fundamental concepts of computer architecture, organization, and operating systems, including data representation, processing, and system performance optimization.
- 2. **Explore** advanced techniques in memory management, microprogrammed control, and input/output systems for efficient and reliable system operations.
- 3. **Analyze** the design, implementation, and functionality of file systems and operating system components, focusing on memory, process management, and security.

Course Outcomes: After Successful completion of course the students will
 CO1 Empathize the foundational concepts of computer architecture, including BTL2 functional units, instruction cycles, and data representation techniques for Processor Design.
 CO2 Demonstrate the ability to differentiate and design microprogrammed and BTL3 hard-wired control units and analyze memory system hierarchies, including cache and virtual memory for Hardware Development.
 CO3 Analyze and implement input-output system strategies, including DMA, BTL3 priority interrupts, and communication protocols, to optimize system operations for Device Communication.
 CO4 Apply the structure, implementation, and management of file systems and BTL4 memory, emphasizing free-space management and allocation methods for Storage Management.



CO5 Evaluate operating system principles to solve problems related to process BTL5 scheduling, deadlock prevention, memory management, and system security in real-world scenarios for System Security.

Syllabus	
Unit I Foundations of Computer Architecture and Operations 5	Hrs
Computer Types and Functional Units, Bus Structures and Software, Performance Multiprocessing Systems, Data Representation, Register Transfer and Micro-Opera Instruction Cycle and Memory Reference Instructions, Instruction Formats, Addr Modes, and RISC	ce and ations, ressing
Case Study 1: "Designing a Simple ALU for Arithmetic and Logical Operations" CaseStudy2 "Comparing Fixed-Point and Floating-Point Representation in Emb Systems"	bedded
Unit II Introduction to Microprogrammed Control 5	Hrs
Introduction to Microprogrammed Control, Hard-Wired vs. Microprogrammed C Microprogramming Techniques Basics of Memory Systems, Cache Memory, Virtual Memory and Secondary St Introduction to RAID and Memory Hierarchies	Control, torage,
Case Study 1: "Cache Memory Optimization in Multi-core Processors" Case Study 2: "RAID Configurations for High-Availability Data Storage"	
Unit III Modern Input-Output Systems and Peripheral Integration 6	Hrs
Priority Interrupts, Direct Memory Access (DMA) and I/O Processors, Serial Community Fundamentals and Protocols, Peripheral Component Interconnect (PCI) and Architectures, Standard Serial Communication Protocols: RS232, USB, IEEE Advanced Input-Output Systems and Integration Techniques.	ication d Bus E1394,
Case Study 1: "I/O Systems in Linux: Handling Multiple Peripherals and DMA" Case Study 2: "RS232 and USB Communication Protocols in Embedded Systems"	
Unit IV Operating Systems: Foundations, Process and Memory5 Management	Hrs
Introduction to Operating Systems, Process Management, Threads, Structures Prote Security, and Distributed Systems Memory Management Fundamentals, Virtual Memory and Page Replacement, P Concepts and Scheduling Principles of Deadlock	ection, Process
Case Study 1: "Memory Management in Linux: Swapping, Paging, and Virtual Memory Case Study 2: "Deadlock Prevention and Recovery in Windows: A Practical Approach"	y" "
Unit V File Systems and Advanced Memory Management Techniques 5	Hrs
File System Interface: The Concept of a File and Access Methods, Directory Structu File System Mounting, File Sharing and Protection Mechanisms, File System Structu	ire and ire and
Implementation, Directory Implementation and Allocation Methods, Free- Management Techniques, Advanced Memory Management	-Space
Case Study 1: "File System Implementation in Linux: Inodes and Block Allocation" Case Study 2: "Free Space Management in NTFS: Bitmap and Linked-List Techniques' Text Books:	"



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- 1. Abreham Silberchatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, John Wiley, 2020, 8th Edition, ISBN: 9780470128725.
- 2. William Stallings, Computer Organization and Architecture, Pearson, 2019, 8th Edition, ISBN: 9788131732458.
- 3. Carl Hamacher, Zvonks Vranesic, SafeaZaky, Computer Organization, McGraw Hill Education, 2011, 5th Edition, ISBN: 9781259005275.
- 4. M. moris mano, Computer System Architecture, Pearson, 1992, 3rd edition, ISBN: 9780131755635.

Reference Books:

- 1. Andrew S Tanenbaum, Modern Operating Systems, Prentice Hall PTR, 2022, 2nd Edition, ISBN: 0-13-031358-0.
- 2. William Stallings, Operating Systems Internals and Design Principles, Pearson Education, 2009, 6th Edition, ISBN: 9780136006329.
- Brian L. Stuart, Principles of Operating System, Delmar Cengage Learning, 2008, India Edition, ISBN: 9780538749534.
- 4. Sivarama Dandamudi, Fundamentals of Computer Organization and Design, Dreamtech Press, 2006, Springer Int. Edition, ISBN: 978-8181280244.
- 5. William Stallings, Computer Organization and Architecture, Pearson, 2002, 6th Edition, ISBN: 978-0130351197.
- 6. Andrew S. Tanenbaum, Structured Computer Organization, PHI, 1998, 4th Edition, ISBN: 978-0130959904.

Journal Papers:

- 1. A.K. Agrawala and T.G. Rauscher "Foundations of microprogramming: architecture software, and application "Academic Press, New York, 1976, 416 pp.
- Xiao-Hui Cheng; You-min Gong; Xin-zheng Wang,"Study of Embedded Operating System Memory Management"IEEE *Xplore*: 26 May 2009,DOI: 10.1109/ETCS.2009.753

VLab:

1. Computer Organisation and Architecture Lab.

https:/coa-iitkgp.vlabs.ac.in

2. Computer Organization Lab.

https:/cse11-iiith.vlabs.ac.in

MOOCs:

NPTEL:

- 1. Introduction To Operating Systems, By Prof. Chester Rebeiro | IIT Madras https://onlinecourses.nptel.ac.in/noc23_cs101/preview
- Computer architecture and organization By Prof. Indranil Sengupta, Prof. Kamalika Datta | IIT Kharagpur
 https://orline.communel.com/prof.20

https://onlinecourses.nptel.ac.in/noc20_cs64/preview



Scheme for Theory Evaluation

Component	Level	Parameters	Marks	Total	Passing
Continuous	Progressive	Understanding Viva Voce	20	50	20
Comprehensive	Evaluation	Involvement, Participation, and	10		
Evaluation(CCE)	valuation(CCE) Engagement				
		Quality of Submission of	10		
		Report			
		Attendance	10		
	End	Performance	25	50	20
	Evaluation	Oral Examination	25		

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	1	-	-	2	-	-	-	-	1	1	-	-
CO2	2	2	2	-	2	-	-	-	-	-	2	2	1	-
CO3	1	2	2	-	2	3	-	1	-	2	1	2	2	1
CO4	2	2	2	-	-	2	-	-	-	-	1	2	-	-
CO5	3	2	1	1	2	2	-	1	-	-	2	2	1	-

3: High, 2: Moderate, 1: Low, 0/-: No Mapping



B Tech in AI & DS Engineering | S Y B Tech Semester IV (2024 COURSE)

Course Category	7	Multidisciplinary Minor	7	Course AD124MD4 Code)406	
Course T	ïtle				Ι	Data Sc	ience)		
Teaching Scheme				Evaluation Scheme						
				Theory % M			arks	Pra %	actical Marks	
L (Hr)	T (Hr)	P (Hr)	Cr	Exam	Max % Min Passi		for ing	Max	Min Passing	for g
2	-	-	2	CCE	50	20	40			
Total Hours:26			ESE	50	20		-	-		

Prereq	Prerequisites: Statistics, DataBase Management System							
Course	Course Objective: After successful completion of course, student will be able to:							
1. St 2. D 3. A 4. E 5. V	 Study the importance of Data Science. Demonstrate computational statistics in Data Science. Analyze the different technologies used for Data processing. Evaluate Data Analytics and Regression Analysis for Metrics evaluation. Validate model evaluation for result optimization. 							
Course	Course Outcomes: After successful completion of course, student will							
CO1	Demonstrate needs of Data Science and different Data Wrangling Methods for data preprocessing.	BTL2						
CO2	Apply Statistics for Data Science for solving mathematical techniques.	BTL3						
CO3	CO3 Analyze the lifecycle of Data Analytics to provide a structured BTL4 BTL4							
CO4	O4 Evaluate Data Analytics and Regression Analysis BTL5							
CO5	Evaluate Model Performance to perform accurate predictions or classifications.	BTL5						

Syllabus		
Unit I	Fundamentals of Data Science	5 Hrs
Basics and Science and Data Collec	need of Data Science, Applications of Data Science, Relationship betwee Information Science, Business intelligence versus Data Science, Data: Data tion. Need of Data wrangling, Methods: Data Cleaning, Data Integration	n Data Types, n, Data



Reduction, I	Data Transformation, and Data Discretization.							
Case Studie	·S:							
1.Nettlix: Uses data science to analyze user viewing history, preferences, and ratings to								
recommend personalized content, leading to increased user engagement and retention.								
2.Amazon: Employs data science to optimize product recommendations, optimize supply chain logistics and personalize sustomer experiences resulting in higher sales and sustomer								
satisfaction								
Unit II	Statistics for Data Sajanaa	6 Ure						
	Statistics for Data Science	0 111 5						
Building bl	ocks – Probability Distributions, Normal Distribution, Central Limit The	eorem.						
Inferential S	Statistics, Sampling, Concept of Hypothesis Testing: Statistical Methods, Z/	/t-tests						
(One sample	e, independent, paired), Analysis of variance, Correlations and Chi-square .Imp	oortant						
modules for	statistical methods : NumPy, SciPy, Pandas, Bayes theorem, Basics and number	eed of						
hypothesis a	and hypothesis testing, Pearson Correlation, Sample Hypothesis testing, Chi-S	Square						
Tests, t-test.		_						
Case Studie	25:							
1.Market R	Research: A marketing team uses chi-square tests to analyze customer survey of	data to						
understand	the relationship between demographic factors (e.g., age, gender) and p	roduct						
preferences.								
2. Practo:	a healthcare platform, uses A/B testing to optimize user experience. For exa	ample,						
they might	test different layouts for the homepage to determine which version leads to	higher						
user engage	ment, such as increased appointment bookings or consultations.							
Unit III	Data Analytics Life Cycle and Regression Analysis	5 Hrs						
Introduction	, Data Analytic Lifecycle, Discovery, Data Preparation, Model Planning,	Model						
Building,Co	mmunication results, Operationalize. Regression analysis : Linear Regre	ession,						
Logistic Reg	gression.							
Case Studie	28:							
1.Flixflix:	To identify customers at risk of canceling their subscriptions to implement ta	ırgeted						
retention str	ategies.							
2.Global In	novation Social Network and Analysis (GINA) : Apply data analytics to ic	lentify						
Innovators v	Vithin the company.	5 IIma						
	Classification and Clustering Wodels	<u>э пг</u>						
Classificatio	n models:Naïve Bayes, Decision Trees, Multinomial Naïve Bayes. Le	ogistic						
Regression,S	Support Vector Machines Random Forest Evaluating Classification Models.Clus	stering						
Algorithms:	K-Means, Hierarchical Clustering, Time-series analysis. Introduction to	o Text						
Analysis: Te	ext-preprocessing, Bag of words, TF-IDF and topics.							
Case Studie	·S:							
1. Netguru	Improving customer service by using NLP-Based Chatbot.							
2. Telecomm	iunications company: To identify customers at risk of churning to impl	lement						
targeted rete	ntion strategies and improve customer satisfaction.							
Unit V	Model Evaluation							
Unit v	Widder Evaluation	5 Hrs						
Model Evalu	uation and Selection: Metrics for Evaluating Classifier Performance, Holdout M	Aethod						
and Random	1 Sub sampling, Parameter Tuning and Optimization, Result Interpretation, Clus	stering						
and Time-se	ries analysis using Scikit- learn.							
Case Studie	·S:							
1.Compute	Confusion matrix to find TP, FP, TN, FN, Accuracy, Error rate, Precision, Red	call on						
the Iris datas	set							



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2.Use IRIS dataset from Scikit and apply clustering methods

Text Book:

- 1. David Dietrich, Barry Hiller, "Data Science and Big Data Analytics", EMC education services, Wiley publication, 2012, ISBN0-07-120413-X.
- 2. McKinney W., "Python for Data Analysis: Data Wrangling with Pandas, NumPy and IPython". F2nd edition, O'Reilly Media.
- 3. Jiawei Han, Micheline Kamber, and Jian Pie, "Data Mining: Concepts and Techniques" Elsevier Publishers Third Edition, ISBN: 9780123814791, 9780123814807.

Reference Books:

- 1. EMC Education Services, "Data Science and Big Data Analytics- Discovering, analyzing Visualizing and Presenting Data" Ist Edition.
- 2. DT Editorial Services, "Big Data, Black Book", DT Editorial Services, ISBN: 9789351197577, 2016 Edition.
- 3. Chirag Shah, "A Hands-On Introduction To Data Science", Cambridge University Press, (2020), ISBN: ISBN 978-1-108-47244-9.
- 4. Wes McKinney, "Python for Data Analysis", O' Reilly media, ISBN: 978-1-449-31979-3.

Journal Papers:

- 1. Hamed Jahani, Richa Jain ,Dmitry Ivanov,Data science and big data analytics: a systematic review of methodologies used in the supply chain and logistics research, Annals of Operations Research https://doi.org/10.1007/s10479-023-05390-7Springer Nature, 1 July 2023.
- Christian Haertel, Vincent Donat, Danie, The Application of Data Science at Original Equipment Manufacturers: A Literature Review, IEEE Access, VOLUME 12, July 2024 Digital Object Identifier 10.1109/ACCESS.2024.3444700
- Longbing Cao, Data Science: A Comprehensive Overview, ACM Computing Surveys (CSUR), Volume 50, Issue 3, Article No.: 43, Pages 1 – 42, Published: 29 June 2017, https://doi.org/10.1145/307625

VLab:

https://nlp-iiith.vlabs.ac.in/exp/word-generation/ https://nlp-iiith.vlabs.ac.in/exp/word-analysis/

MOOCs:

https://onlinecourses.nptel.ac.in/noc21_cs69/preview https://archive.nptel.ac.in/courses/110/106/110106072/

Scheme for Theory Evaluation

Component	Level	Unit 1	Unit 2	Unit 3	Unit 4	Total	Passing
Continuous	Faculty	7	6	6	6	25	20
Evaluation(CCE)	Department	7 Unit 7 (UT1)	6 Fest 1	6 Unit (UT2)	6 Test 2	25	


End	Semester	Institute	13	12	13	12	50	20
Examination								
(ESE)								

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	3	2	1	1	2	1	1	1	1	1	1	-	1
CO2	1	2	1	2	1	2	3	1	1	2	1	1	1	1
CO3	2	1	2	1	2	1	1	1	1	1	1	1	1	1
CO4	1	2	2	2	2	1	1	1	1	1	1	1	1	1
CO5	3	2	1	1	2	2	-	1	-	-	2	2	1	-

3: High, 2: Moderate, 1: Low, 0: No Mapping



B Tech in AI & DS Engineering | S Y B Tech Semester IV (2024 COURSE)

Course Cate	gory	Open Elect	ive	Course Code			AD124OE407				
Course Title		Personal Productivity	and	d Workplace							
	Teaching	E	valuation	Sche	me						
I.	т	P	Cr	Theor Marks		.y %		y % Prac s % N		ctical Iarks	
(Hr)	(Hr)	(Hr)	Cr	Exam	Max %	Min Mark s for Passi		Max	Min Mai for Pass	rks	
2	-	-	2	ССЕ	50	20	40				
Total Hours:26				ESE	50	20					

Prerequisites: None

Course Objective: After successful completion of course, student will be able to:

- 1. Understand fundamental principles of productivity and apply effective time management strategies.
- 2. Utilize digital and behavioural tools to enhance personal efficiency and develop sustainable habits.
- 3. **Develop professional communication and teamwork skills** to optimize workplace collaboration and project execution.
- 4. **Implement advanced productivity strategies** such as deep work, cognitive load management, and AI-powered automation.
- 5. Assess and improve long-term personal and workplace productivity through self-reflection, feedback, and strategic planning.

Course	Course Outcomes: After successful completion of the course ,students will						
CO1	Apply fundamental productivity and time management principles to personal and professional tasks						
CO2	Utilize digital tools and habit-forming techniques to enhance daily efficiency.	BTL3					
CO3	Demonstrate workplace productivity through effective communication, teamwork, and leadership strategies.	BTL4					
CO4	Implement deep work, cognitive load management, and AI tools for enhanced productivity.	BTL5					
CO5	Develop a personal productivity roadmap for long-term career and workplace success.	BTL6					



	1							
	Syllabus							
Unit 1	Fundamentals of Productivity & Time Management	6 Hrs						
Introductio	Introduction to Productivity: Myths vs. Reality							
Time Man	agement Frameworks: Eisenhower Matrix, Pomodoro Technique, GTD							
Goal Settin	ng & Prioritization: SMART Goals, OKRs							
Overcomi	ng Procrastination & Distractions: Deep Work, Digital Detox							
Case Stud Case Stud	y & Activities: ly 1.							
How Elon	Musk Manages Time Using the 5-Minute Rule & Time Blocking							
Activity:								
Personal T Pomodoro SMART (Personal Time Audit: Students analyze how they spend their time daily Pomodoro Challenge: Apply the Pomodoro technique to a real task SMART Goals Workshop: Setting actionable personal & professional goals							
Unit II	Tools & Techniques for Personal Efficiency	6 Hrs						
Productivity Second Bra Managemen	y Apps & Digital Tools: Notion, Trello, Todo list, AI Assistants, Mind Mapping & N ain, Habit Stacking & Routine Design (Atomic Habits Approach), Work-Life Balan nt	ote-Taking: ce & Stress						
Case Study & Activities: Case Study 1.								
Activity:								
Productivity App Demo: Hands-on with Notion, Trello, or Asana Mind Mapping Exercise: Visualizing ideas for problem-solving 30-Day Habit Challenge: Creating & tracking new habits								
Unit III	Workplace Productivity & Collaboration	6 Hrs						
Effective C Project Man Decision-M Delegation	ommunication & Teamwork: Email & Meeting Etiquette, Active Listening nagement & Agile Workflows: Kanban, Scrum, Time Blocking laking & Problem-Solving: Analytical Thinking, Root Cause Analysis & Leadership: Empowering Teams, Feedback Culture							



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Case Study & Activities:

Case Study 1.Google's 20% Rule: How Giving Employees Free Time Increases Innovation Activity:

Email Writing Challenge: Writing professional, clear, and concise emails Agile Sprint Simulation: Managing a mock project using Kanban or Scrum Decision-Making Role Play: Teams solve a workplace dilemma using root cause analysis

Unit IV	Advanced	Productivity	Strategies
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6 Hrs

Deep Work & Flow State: Achieving Peak Focus, Cognitive Load Management: Multitasking vs. Monotasking, Productivity in Hybrid & Remote Work: Virtual Collaboration, Automation & AI for Productivity: How AI Can Optimize Workflow

Case Study & Activities:

Case Study 1.How Cal Newport's "Deep Work" Concept Transformed Microsoft's Research Labs

Activity:

Distraction-Free Challenge: 1-hour deep work session using time blocking AI-Powered Productivity: Automating repetitive tasks using AI tools Hybrid Work Simulation: Managing a remote team using productivity software

Unit V	Performance Enhancement & Long-Term Growth	6 Hrs
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Continuous Learning & Skill Development: Growth Mindset, Lifelong Learning Personal Branding & Productivity Mindset: Building Influence Review & Self-Assessment: Productivity Audits, Feedback Loops Capstone Project: Creating a Personal & Workplace Productivity Roadmap

Case Study & Activities:

Case Study 1. How Warren Buffett & Steve Jobs Prioritize Work & Eliminate Distractions

Activity:

Personal Productivity Audit: Reviewing & optimizing daily routines Career Vision Board: Designing a long-term growth plan Final Capstone Project: Creating a custom productivity roadmap

Text Books:

- 1. David Allen, Getting Things Done: The Art of Stress-Free Productivity David Allen, Penguin Books, ISBN: 978-0143126560
- 2. James Clear, Atomic Habits: An Easy & Proven Way to Build Good Habits & Break Bad



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Ones, Random House, ISBN: 978-0735211292

References Books:

- 1. Cal Newport, Deep Work: Rules for Focused Success in a Distracted World, Publisher: Grand Central Publishing, ISBN: 978-1455586691
- 2. Stephen R. Covey, The 7 Habits of Highly Effective People, Simon & Schuster, ISBN: 978-1982137274

Scheme for Theory Evaluation

Component	Level	Parameters	Marks	Total	Passing	
Continuous	Progressive	Understanding Viva Voce	20	50	20	
Comprehensive Evaluation (CCE)	Evaluation	Involvement,Participation and Engagement	10			
		Quality of submission of report	10			
		Attendance	10			
		Performance	25	50	20	
	End Evaluation	Oral Examination	25			

CO-PO Mapping

	РО	PO	РО	PO	РО	PSO	PSO	PSO						
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	-	-	-	-	-	-	2	3	-	3	3	2
CO2	2	3	3	-	3		-	-	-	2	-	3	2	2
CO3	-	-	3	3		2	-	2	3	3	3	2	3	3
CO4	3	3	2	3	3	1	-	-	-	-	-	3	3	2
CO5	3	3	-	2	3	2	1	-	-	3	3	2	2	2

3: High, 2: Moderate, 1: Low, 0: No Mapping

Note:As per DYPCOE NPTEL Credit Transfer Policy, Credit Transfer is applicable for NPTEL/SWAYAM courses that are aligned with Program-Specific Electives, Open Electives and Additional Learnings like Non-Credit Courses etc.



B Tech in AI & DS Engineering | S Y B Tech Semester IV (2024 COURSE)

Course CategoryVocational Enhancement Course 3			l Skill e 3	Course Cod	e AD124VS408			
Cou	rse Title	Advance	Excel					
Teac	hing Schem	e			Evaluation Scheme			
L	Т	Р	Cr	Exam	Theory % Marks			
					Max	Min for Pass		
1	-	2	2	CCE	100	40		
19	-	20						
Total Hours:39								

Prerequisites: Basic Excel Course Objective: After Successful completion of course units, students will be able to 1. Impart fundamental knowledge of Excel functions and formulas to perform data analysis, logical operations, and lookup operations for business applications. 2. Develop skills in data visualization and formatting techniques by using charts, pivot tables, and conditional formatting for analysing data effectively. 3. Equip with automation and validation techniques in Excel streamlining data processing and enhancing the security through the use of macros and VBA programming. 4. Enable data manipulation and management by using advanced Excel functions (e.g., INDEX, MATCH, TEXT, OFFSET) to organize and process large datasets effectively. Course Outcomes: After successful completion of the course the student will **CO1** Identify and recall basic Excel functions (e.g., SUM, AVERAGE, MAX, MIN, BTL1 COUNT, VLOOKUP, HLOOKUP) and their usage for data analysis. **Explain the purpose and application** of logical, mathematical, and statistical **CO2** BTL2 functions (e.g., IF, AND, OR, SUMIF, AVERAGEIF) to analyze and manipulate data. **CO3** Apply conditional formatting, text functions, and chart creation techniques to BTL3 format data and visualize information effectively. **CO4** Analyze datasets by creating pivot tables and interactive dashboards to BTL4 summarize and present data insights.



CO5	Design and implement Excel macros and VBA code to automate repetitive	BTL5
	tasks and enhance workbook functionality.	

Syllabus								
Unit I	Introduction to Excel	4 Hrs						
Basic Excel functions: Like SUM, AVERAGE, MAX, MIN, COUNT to analyse the data Mathematical & Statistical Functions: SUMIF, COUNTIF, AVERAGEIF, etc Logical Functions: IF, AND, OR, NOT, IFERROR								
Unit II	LookUP Functions and Formatting	4 Hrs						
Lookup & Reference Functions : VLOOKUP, HLOOKUP Conditional formatting: Analyse and visually highlight data based on specific criteria								
Unit	Text Functions and Charts	3 Hrs						
Text fun Concate Charts:	ctions : manipulate, clean, and extract information from a dataset containi enating Information Column, Bar, Line, Pie, Scatter	ng textual data						
Unit IV	Pivot Tables and Dashboards	4 Hrs						
 Pivot Tables in Excel: Summarizing Data using Tables and charts, Creating Interactive Dashboards: Using Slicers & Timelines for Dynamic Filtering, Using Form Controls & Dr drop-downs for User Interactivity 								
Unit V	VBA and Validation	4 Hrs						



Introduction to Macros & VBA: Recording and Running Macros, Assigning Macros to Buttons,

Editing Macros in, Saving and Sharing Macros

VBA: Editor, VBA Programming for Excel Automation

Protecting Sheets & Workbooks: Data Validation Rules (Restricting Input), Error Messages & Alerts for valid Data

Guidelines for Instructor's Manual

The Instructor's Manual serves as a comprehensive guide for teaching and managing Advanced Excel sessions. It outlines the key components and strategies for effective laboratory conduction, student engagement, and assessment

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Software and Hardware requirements, Assessment grade/marks and assessor's sign. Include a set of well-structured assignments, such as:

Data Cleaning: Using functions like TEXT, TRIM, and SUBSTITUTE.

Pivot Tables: Generating reports from a large dataset with slicers and filters.

Macros: Automating data entry and report generation.

Guidelines for Laboratory /Term Work Assessment

Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign grade/marks based on parameters, such as timely completion, performance, innovation, efficient codes, and punctuality. Lab Conduction Guidelines

- Pre-Lab Preparation:
 - Ensure all systems have the latest version of Excel installed with necessary add-ins like Power Query, Power Pivot, and VBA Editor.
 - Verify that lab instructions, sample datasets, and reference material are accessible.
- During Lab Sessions:
 - Begin each session with a brief explanation of the day's topic.
 - Provide step-by-step guidance and practical examples.
 - Facilitate group discussions and hands-on exercises.



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• Post-Lab Activities:

Encourage students to summarize their learnings and apply them to solve additional problems.

Continuous Improvement

- Collect feedback from students after each session.
- Update the manual with new tips, tricks, and advanced techniques as per industry trends.

Mini Project

	Syllabus	
Sr No	Group A Perform Any 8 assignments.	
PR1	Demonstrate Basic Excel functions. Problem Statement: Create a salary sheet for employees, including columns for basic pay, HRA (15%), DA (15%), and net salary (Basic + HRA + DA). Use functions like SUM, AVERAGE, MAX, MIN, COUNT to analyse the data. Use Following Dataset: <u>https://www.kaggle.com/datasets/yasserh/employee-salaries-datatset</u>	2 Hrs
PR2	Data Analysis with Charts & Graphs – Consider Data Menu, Subtotal, and Filtering Data Working with functions & formulae Formatting worksheets, Securing & Protecting spreadsheets.	2 Hrs
PR3	Execute Lookup Functions (VLOOKUP, HLOOKUP) Problem Statement: Create an employee salary sheet including their employee IDs, names, and departments. You need to find specific employee details based on partial or exact matches to criteria, such as finding an employee's department based on a fragment of their name or a specific ID. Create a solution that uses both the VLOOKUP and SEARCH functions together to efficiently retrieve relevant data. Specifically, search for employee names or IDs using partial matches and use VLOOKUP to return the corresponding department or other details associated with the matching employee.	2 Hrs
	Objective: i) Use the SEARCH function to identify whether a specific string (like a part of a name or an ID) exists in the employee name or ID column. ii) Combine SEARCH with VLOOKUP to look up the employee's department or other details based on a partial or full string match. iii) Ensure the formula handles cases where no match is found by returning a clear message or error (e.g., "Not Found").	



	Use following Dataset	
	https://www.kaggle.com/datasets/mohamedelkahwagy/salary-data-sheet- for-a-company	
PR4	Conditional formatting	2 Hrs
	Objective:	
	The objective of this exercise is to apply conditional formatting. in Excel to analyse and visually highlight data based on specific criteria. Scenario: You are tasked with analysing the sales performance of a company's regional sales representatives. The data contains the following columns: Sales Rep Name, Region,Monthly Sales (\$), Target Sales (\$),Performance (%)	
	Tasks:	
	 i) Apply Conditional Formatting to visually highlight the sales performance: ii) Highlight green if the Performance (%) is 100% or more (indicating the rep has met or exceeded the target). iii) Highlight yellow if the Performance (%) is between 80% and 99% (indicating the rep is underperforming but close to the target). iv) Highlight red if the Performance (%) is less than 80% (indicating a significant underperformance). 	
	Use following Dataset	
	https://www.kaggle.com/datasets/shedai/sales-person-performance	
PR5	Financial Functions	2 Hrs
	Objective:	
	 Analyse the company's financial performance using set of financial functions as per following requirements: 1) Loan Amortization: a) For a given loan amount, interest rate, and loan term calculate monthly loan payments (PMT). 2) Investment Paturns: 	
	a) Calculate the future value (FV) of an investment given an initial amount,	
	interest rate, and time period. b) Calculate the present value (PV) for future cash flows or investments	
	3) Financial Ratios:	
	a) Use Excel functions like AVERAGE, SUM, DIVIDE, and IF to analyze financial statements and determine the company's financial health. Use following Dataset	



	https://www.kaggle.com/datasets/rish59/financial-statements-of-major-co	
	mpanies2009-2023	A 11
PR6	Problem Statement: Text Functions in Excel	2 Hrs
	The objective of this problem is to use Excel's text functions to manipulate,	
	clean, and extract information from a dataset containing textual data.	
	Given a dataset of customer information that includes the following columns:	
	Full Name: A combination of first and last names (e.g., John Doe).	
	Email Address: Contains the customer's email address (e.g.,	
	John.doe@example.com).	
	Phone Number: A phone number that includes country code, area code, and number ($a_{2} = \pm 1.(122).456.7800$)	
	number (e.g., +1 (123) 436-7890).	
	Address: Contains customer address information.	
	Do the following tasks:	
	LATACI FILST and Last Name	
	two separate columns: First Name and Last Name	
	· Hint: Use TEXTSPLIT I FET RIGHT and FIND functions	
	Extract Domain from Email Address	
	\cdot Extract the domain (e.g. example com) from the email address in the	
	"Fmail Address" column	
	· Hint: Use the RIGHT FIND and LEN functions	
	Format Phone Number	
	• Reformat the phone number in the "Phone Number" column to the format	
	(XXX) XXX-XXXX. ignoring the country code.	
	• Hint: Use TEXT, MID, and SUBSTITUTE functions.	
	Find and Replace Specific Text	
	· In the "Address" column, replace all occurrences of the word "Street" with	
	"St.".	
	· Hint: Use the SUBSTITUTE function.	
	Check for Empty Cells	
	• Use an appropriate function to check if any cells in the "Email Address" or	
	"Phone Number" column are empty.	
	· Hint: Use IF and ISBLANK functions.	
	Concatenate Information	
	• Create a new column that combines the First Name, Last Name, and Email	
	Address in the format: "John Doe - john.doe@example.com".	
	• Hint: Use the CONCATENATE or TEXTJOIN function.	
	Use following Dataset	
	https://www.kaggla.com/datasats/aarria1/aaammaraa.data	
PR7	https://www.Kaggit.com/uatastis/carrier/ccommerce-uata	
	Pivot Tables in Excel	
	a) Enter the Pivot Table Data Create the Pivot Table Adding Data to the	
	Pivot Table Filtering the Pivot Table Data	
	b) Change the Pivot Table Data Analyze Data Columns in Pivot Tables	
	Adjust Data to Analyze	



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PR8	Macros Objective Perform	e: the following ta	asks using Mac	eros:	2 Hrs		
	· E	nable Excel Ma	icros				
	 Turn on the Developer Tab in Excel Record a Macro in Excel Run the Macro in Excel Run Macro By Clicking a Button Run a Macro from Excel Ribbon (Developer Tab) Create Macro in VBA Editor View Macros in MS Excel Save the Recorded Macros in Excel 						
PR9	Data Vali	dation			A 11		
	Problem:				2 Hrs		
	Create a sales forecasting model that allows users to input values for unit price, quantity sold, and discount rate. Ensure that the model is used correctly, implement the following data validation rules: i) Unit price: The unit price should be a positive number greater than 0. ii) Quantity sold: This should be a whole number greater than or equal to 1. iii) Discount rate: This should be a percentage between 0% and 50%						
	inclusive.	nnronriata arr	or massagas fo	r invalid data is entered			
			or messages to	i mvanu uata is chici cu.			
	Example	Dataset:					
	Unit Pric	e Quantity Solo	d Discount Rate	Total Sales Forecast			
	\$25	15	0.10	\$337.50			
	\$50	25	0.05	\$950.00			
	\$10	30	0.20	\$360.00			
	\$35	40	0.15	\$1275.00			
	\$40	10	0.00	\$450.00			
PR10	Data Visu Develop presents l graphs.	alization a data visualiz xey insights fro	ation solution m a dataset th	in Microsoft Excel that effectively rough various interactive charts and	2 Hrs		



	Example Dataset for Sales Data:								
	Sales Date	Product Category	Region	Sales Amount (\$)	Quantity Sold				
	2024-01-01	Electronics	North	1500	25				
	2024-01-02	Clothing	South	1200	40				
	2024-01-03	Furniture	East	2000	10				
	2024-01-04	Electronics	West	1800	15				
	Perform Fol	lowing Tasks	:						
	 Amount (\$) on the Y-axis to visualize how total sales have changed over time. Sales by Region: Create a bar chart considering Region for the categories and Sales Amount (\$) for the values to compare total sales by region 								
	 Sales by Product Category: Create a pie chart considering Product Category for the slices and Sales Amount (\$) to determine the size of each slice, show the percentage of total sales by product category. 								
	 Sales Performance by Quantity Sold: Create a scatter plot or column chart to show the relationship between Quantity Sold and Sales Amount (\$) considering Quantity Sold for the X-axis and Sales Amount (\$) for the Y-axis. 								
	 Interactive Filters: Use Slicers to allow users to filter data by Region or Product Category, adjust the visualizations dynamically based on their selection. 								
Group B	I								
Mini project	(Compulsory	assignment)							
1	Dashboard	Creation: De	esigning a	n interactive dashbo	ard with charts,				
Fext Book:	silvers, and I		,						



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- 1. Excel 2010 Advanced ©2011 Stephen Moffat, The Mouse Training Company & Ventus Publishing ApS ISBN 978-87-7681-788-6
- 2. Mastering Advanced Excel by Ritu Arora (Author) ISBN-13 978-9355518651

References Books:

- 1. Microsoft Excel 2019: Data Analysis & Business Model Paperback 11 October by L. Winston Wayne (Author) ISBN-13 978-9389347180
- 2. Advanced Excel VLOOKUP, HLOOKUP and Pivot Tables -Excel 2010, Carnegie Mellon University

Journal Papers:

- 1. Magiri, Jane & Barasa, Peter. (2024). Effect of Supplier Relationship Management Practices on Organizational Performance of Supermarkets in Kenya: A Case of Naivas Supermarkets in Nakuru County. African Journal of Empirical Research. 5. 684-694. 10.51867/ajernet.5.4.56.
- 2. Kumar, M & Manickam, Dinesh. (2023). A Study on Importance of Microsoft Excel Data Analysis Statistical Tools in Research Works. 1. 76-83. 10.5281/zenodo.10449150.
- 3. ADEBISI, Jeleel. (2013). MICROSOFT EXCEL.
- 4. Elliott, Alan & Hynan, Linda & Reisch, Joan & Smith, Janet. (2006). Preparing Data for Analysis Using Microsoft Excel. Journal of investigative medicine : the official publication of the American Federation for Clinical Research. 54. 334-41. 10.2310/6650.2006.05038.

MOOCs:

- 1. NPTEL: NPTEL-NOC IITM :<u>https://www.youtube.com/watch?v=uisSkBOGIUM</u>
- 2. Digital Skilling: <u>https://elearn.nptel.ac.in/shop/nptel/digital-skilling/?v=c86ee0d9d7ed</u>
- 3. Learning Analytics Tools: <u>https://onlinecourses.nptel.ac.in/noc21_ge21/preview</u>
- 4. https://www.udemy.com/course/microsoft-excel-for-scientists-and-engineers/?srsltid=AfmBOo ou4zH4bG72ahT8IdAoUfxXKniUAr8KM59YF9zOsKLg73WnwXub&couponCode=BFCPS ALE24

Online Resources:

1. Microsoft: Microsoft's Official Excel Tutorials,

https://support.microsoft.com/en-us/office/apply-data-validation-to-cells-29fecbcc-d1b9-42c1-9d76-eff 3ce5f7249

:

2. Kaggle for dataset

3.Coursera

https://www.coursera.org/courses?query=microsoft%20excel&productDifficultyLevel=Advanced

4. tutorialspoint.com: <u>https://www.tutorialspoint.com/advanced_excel/index.htm</u>



Scheme for Practical Evaluation

Component	Level		Total	Passing
Continuous Comprehensive	Progressive Evaluation	Understanding Viva Voce	20	40
Evaluation(CCE)		Involvement, Participation, and Engagement	20	
		Quality of Submission of Report	20	
		Attendance	20	
		Performance	20	

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1		3	2		1	1	1	3	3	2	1
CO2	3	2	1		3	2		1	1	1	3	3	2	1
CO3	3	2	2	1	3	1		1	1	1	1	2	2	1
CO4	3	2	2	1	3	1		1	1	1	1	2	2	
CO5	3	3	3	2	3	2	1	1	2	2	2	1	1	2

3: High, 2: Moderate, 1: Low, 0: No Mapping



B Tech inAI & DS Engineering | S Y B Tech Semester IV (2024 COURSE)

Course	Category	Ability Enhancer Course	Ability Enhancement Course		Course Code			AD124AE409		
Course	Title		Workplace and Life Readiness							
Teaching Scheme					ŀ	Evaluation	Scheme)		
					Theory % Marks		B Pra	Practical % Marks		
L (Hr)	T (Hr)	P (Hr)	Cr	Exam	Max %	Min Marks for Passing	Max	Min Mark s for Passing		
1	-	2	2							
13	-	26	-	CCE			100	40		
Total H	ours:39									

Prerequisites: Basic English Grammar Skills

Course Objectives: After successful completion of course, student will be able to:

1. Equip students with essential professional and technical communication skills necessary for success in the modern workplace.

2. **Emphasize** written and verbal communication.

3. **Study a wide** range of topics, including effective written communication, active listening and public speaking.

Course Outcomes: After successful completion of the course the student will					
CO1	Apply techniques of effective verbal or oral communication for writing precise briefs, essays, reports, technical documents for official communication.	BTL 3			
CO2	Apply ethics and values for being a Good Professional.	BTL 3			
CO3	Analyze professional concepts to work in a team and handle conflicting situations in the corporate world.	BTL 4			
CO4	Evaluate leadership qualities for being a successful professional.	BTL 5			
CO5	Create and deliver Effective Presentations.	BTL 6			

	Syllabus				
Unit I	Self-Introduction & SWOC Analysis	2 Hrs			
Difference be Soft Skills ir maintain you Industry	Difference between hard skills and Soft skills, Introduction of SWOC Analysis, Importance of Soft Skills in corporate setting, Formal / Informal self-introduction, goal setting, and how to naintain your attitude towards various circumstancesApplications of SWOC in domain specific				
Unit II	Writing Skills	2 Hrs			
Practicing and understanding various formats of writing skills. Discussion on types of reports,					

Practicing and understanding various formats of writing skills. Discussion on types of reports, various formats of report writing. Understanding Email etiquette and types of email. Writing



emails on d	ifferent topics. Practicing resume writing and its various	formats. Types of				
Unit III	Professionalism & Ethics	3 Hrs				
Understandin	a othios and morals. Importance of Professional Ethios, hindrar	D IIIS				
of Work ethic	g clines and morals, importance of Professional Ethes, initial	re events dinning				
telephone travelling netiquette social media writing Stress as integral part of life Identifying						
signs and sou	gigns and sources of strong. Stong to some with strong one communication positive thinking					
Belief in ones	self ability to handle failure. Retrospective thinking for future le	, positive uninking, earning Organizing				
skills to enha	ince time management. Focusing on goals smart work vs hard	work Prioritizing				
activities Pe	rils of procrastination Daily evaluation of "to-do" list C	ase studies about				
development	of ethics	use studies usout				
Unit IV	Group Discussion & Personal Interview	3 Hrs				
Introduction t	to Group Discussion. Difference between Group Discussion and	debate. Etiquettes				
while condu	acting Group Discussion. Professional Phases to be	used in Group				
Discussion.ha	undling complexities in GD.Understanding types of Intervie	w. Grooming and				
etiquette whi	le giving an Interview, Understanding Job Description and S	Studying Company				
Profile, Strate	egies and techniques to ace the interview.	<i>B B B B B B B B B B</i>				
Unit V	Interpersonal & Intrapersonal Skills	3 Hrs				
Differences o	f interpersonal and interpersonal skills. Introduction of team bui	ilding, Introduction				
to leadership	and types of Leadership, Identifying your weakness and focussi	ng on your strength				
to become a	good leader, Introduction to Presentation Skills, 5P's of Pres	sentation, Types of				
Presentation		/ 51				
Practical/ La	b Sessions					
Lab	Activities	Duration				
Session						
		(Hrs.)				
1	Speaking Skills- Self Introduction: Introduce your friend	2				
2	Team Building Activity	2				
3	How to study job description and company profile : "Job	2				
	Detective"					
4	Grooming and image management	2				
5	Speaking Skills- JAM Session	2				
6	Speaking Skills- Debate session	2				
7	Group Discussion	2				
8	Group Discussion	2				
9	Case study analysis : Problem solving and critical thinking :	2				
	"The Problem-Solvers' Challenge"					
10	Presentation Skills	2				
11	Presentation Skills	2				
12	Personal Interview – Conducting of mock interview	2				
13	Personal Interview – Conducting of mock interview	2				
Text Books:						
1 Indrajit Bhattacharya "An Approach to Communication Skills" Dhannat Raj						
2 Simon Sweeney "English for Business Communication" Cambridge University Press						
3. Sanjay Kumar and Pushpa Lata, "Communication Skills". Oxford University Press.						
Reference Books:						
1. Atkinson and Hilgard's, "Introduction to Psychology" 14th Edition						
2 Kenne	th G Mcgee "Heads Un How to Anticipate Rusiness S	Surprises & Seize				
Onnor	tunities First" Harvard Business School Press Boston Massach	nusetts				
Opportunities First [*] , Harvard Business School Press, Boston, Massachusetts.						



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3. R. Gajendra Singh Chauhan and Sangeeta Sharma, "Soft Skills-An integrated approach to maximize personality", Wiley Publication, ISBN: 987-81-265-5639-7

MOOCs:

- 1. NPTELCourse"DevelopingSoftSkilland Personality",<u>https://nptel.ac.in/courses/109/104/109104107/</u>
- 2. NPTELCourse"Communication Skills" https://nptel.ac.in/courses/109/104/109104030/
- 3. NPTEL Course "Effective Writing" https://nptel.ac.in/courses/109/107/109107172/
- 4. NPTEL Course "Interpersonal Skills" https://nptel.ac.in/courses/109/107/109107155/

Rubrics for Continuous Evaluation

Rubri	Rubrics for ISE (100)				
No	Component	Marks			
1	Assignment 6 Assignments*5 Marks each = 30 Marks	30			
2	Quiz - Pre & Post Diagnostic Test-15 Marks Quiz on Unit 1 & 2 -15 Marks	30			
3	Micro Project: Content creation- 15 Marks Presentation of the Report-15 Marks	30			
4	Attendance	10			
	Total Marks:	100			

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	2	-	-	-	-	-	-	1	3	-	2	-	-	1
CO2	-	2	-	-	-	-	3	1	-	-	2	-	-	3
CO3	-	-	2	-	-	1	3	3	1	3	2	-	-	3
CO4	-	-	-	2	-	-	3	1	-	2	2	-	-	3
CO5	-	-	-	-	2	-	2	2	1	1	3	-	-	2

3: High, 2: Moderate, 1: Low, 0/-: No Mapping



B Tech in AI & DS Engineering | S Y B Tech Semester IV (2024 COURSE)

Course	Category	Entr nom Man	epreneurship/Eco cs and agement	Course Code			AD1	1 24 EE	410		
Course Title				Project Management and Finance							
	Te	achin	g Scheme		E	valuatio	n Sc	heme			
L T P (Hr) (Hr) (Hr)			Exam Theory % Marks Max Min 1 %			Practical % Marks for Min Marks for g Max					
2	-	-	2	CCA	50	20	40				
Total Hours:26			ESE	50	20						

Prerequisites: Fundamentals of Management Mathematics						
Course Objectives: After successful completion of the course the student will be able t	Course Objectives: After successful completion of the course the student will be able to:					
Describe the various concepts involved in Project Economics						
2. Apply financial tools in project analysis						
3. Select the most feasible project based on different appraisal techniques						
4.Summarize the sources of project finance						
5. Estimate working capital required for a project						
Course Outcomes: After successful completion of the course the student will						
CO1 Understand the Fundamentals of Project Economics	BTL2					
CO2 Apply Financial Tools in Economic Analysis	BTL3					
CO3 Analyze Project Appraisal Techniques	3 Analyze Project Appraisal Techniques BTL4					
O4 Evaluate Financial and Capital Management Strategies BTL5						
CO5 Design Practical Solutions for AI Projects	BTL6					

Syllabus								
Unit I	nit I Fundamentals of Project Economics 5 Hrs							
Introduction to Project Economics: Definition, Principles, Importance in AI industry ,Key Economic								
Concepts: Cost, Value, P	rice, Rent, Simple and Compound Interest, Profit ,Financia	l Tools and						
Diagrams: Cash flow Diag	Diagrams: Cash flow Diagram, Annuities and its Types Time Value of Money, Cost of Capital							
Case Studies: 1.AI-Powered Predictive Maintenance System for Manufacturing								
2.AI Chatbot Development for Customer Service								
Unit II	Financial Planning and Statements	5 Hrs						
Assets and Liabilities ,Bala	ance Sheets: Concept and Numerical Preparation ,Profit & Los	ss Accounts:						
Preparation and Analysis, I	Microeconomics vs. Macroeconomics							
Case Studies:1.AI-Powered Fraud Detection System for Banking								
2.AI-Driven Personalized Marketing System for Retail								
nit III Project Appraisal 5 Hrs								



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6 Hrs

5 Hrs

Types of Appraisals: Political, Social, Environmental, Techno-Legal, Financial, Economical, Project Selection Criteria: Benefit-Cost Analysis, NPV, IRR, Pay-Back Period, Break Even Analysis, Advanced Techniques: TOPSIS, Simple Additive Weighting (SAW), Project Feasibility Report and Detailed Project Report (DPR).

Case Studies: 1. AI-Based Healthcare Diagnostics System 2.AI-Powered Autonomous Delivery Drones

Unit IV

Unit V

Project Finance and Financial Management

Sources of Finance: Long- and Short-Term (Equity, Debt, Government Grants, Alternatives) Financial Metrics: Leverage Ratio, EBIT, Dividend Pay-Out ,Financial Markets & Instruments: Money Market, Secondary Market, Credit, Bills, Income Securities ,Role of Institutions: Banking Institutions, Non-Banking Financial Corporations (NBFCs)

Case Studies: 1.AI-Based Customer Support Automation

2.AI-Powered Autonomous Vehicles Company

Working Capital Management and Applications

Basics of Working Capital: Meaning, Types, Components, Operating Cycle and Factors Affecting Working Capital Requirements, Estimation and Financing of Working Capital

Case Studies: 1. AI-Based Customer Support Automation 2. AI-Powered Autonomous Vehicles Company

Text Books:

- 1. Engineering Economics Management, Dr. Vilas Kulkarni and Hardik Bavishi, S. Chand Publication
- 2. Laws for Engineers, Vandana Bhatt and Pinky Vyas, Pro Care Publisher
- 3. Indian Economy, Gaurav Datt and Ashwani Mahajan, S. Chand Publication
- 4. Industrial Organization & Engineering Economics, T. R. Banga and S. C. Sharma, Khanna Publisher

Reference Books:

- 1. Engineering Economy, Theusen G. J. and Fabrycky W. J., 9th Edition, Prentice-Hall, Inc., New Delhi
- 2. Finance for Engineers: Evaluation and Funding of Capital Projects, Crundwell F. K., Springer, London
- 3. Financial Management, Khan and Jain, Tata McGraw-Hill Education
- 4. Engineering Economy, Leland T. Blank and. Anthony Tarquin, McGraw Hil
- 5. Case studies in Finance, Burner, McGraw Hill
- 6. Engineering Economics by R.Panneerselvam, PHI Learning; 2nd edition (2014)
- 7. Essentials for Decision Makers by Asok Mukherjee, Scitech Publication, New Delhi

Journal Papers:

- 1. H. Yang, W. B. Hwang, S. R. Kim, Project Risk Management in the Financial Sector: A Survey of Techniques and Tools ,IEEE Transactions on Engineering Management 2020
- 2. M. C. Jensen, D. P. Slevin, Financial Project Management in Large-scale IT Projects, IEEE Transactions on Software Engineering,
- 3. M. S. Yadav, P. R. Kumar, Optimizing Financial Resource Allocation in Large Projects Using Data Analytics ,IEEE Transactions on Engineering Management

MOOCs:

https://onlinecourses.nptel.ac.in/noc24_mg01/preview</u> By Prof. Ramesh Anbanandam | IIT Roorkee



Scheme for Continuous Evaluation

Component	Level	Unit I	Unit II	Unit III	Unit IV	Unit V	Total	Passing
	Faculty	5	5	5	5	5	25	10
CCE		Unit Test1			Unit Test 2			
	Department	5	5	5	5	5	25	10
ESE	Institute	10	10	10	10	10	50	20

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	-	2	1	-	-	-	1	1	2	1	2	3	3
CO2	-	-	-	-	-	-	1	-	-	2	1	2	3	2
CO3	-	1	-	1	-	-	-	1	1	2	1	2	3	3
CO4	-	1	2	-	-	-	-	-	-	2	1	1	3	3
CO5	_	-	2	-	-	-	-	-	-	2	1	2	3	3

3: High, 2: Moderate, 1: Low, 0/-: No Mapping



B Tech inAI & DS Engineering | S Y B Tech Semester IV (2024 COURSE)

Cour Cateş	se gory	Value Educatio Course	n	Course C	Course Code			AD124VE411			
Course Title				Sustainab	Sustainable Development II						
Teaching Scheme				Evaluation Scheme							
L (Hr)	T (Hr)	P (Hr)	Cr	Exam	Theory % Marks Max % Marks for		Pract Max	ical % Marks Min Marks for Passing			
2 Total	- Hour	- s: 26	2	ССЕ	50	20	-	-			

Prerec	quisites: None					
Cours	e Objectives: After Successful completion of course units, students will be abl	le to				
1.	Understand Universal Human Values (UHV) - Develop ethical, more	ral, and				
	professional values in students.					
2.	Apply UHV in Personal and Professional Life - Explore human relationships,					
	harmony, and responsible behavior.					
3.	Develop Ethical Decision-Making Skills - Analyze real-life scenarios and case					
	studies to build decision-making abilities.					
4.	Study Constitutional Rights and Duties - Understand fundamental rights, directive					
	principles, and governance structure.					
5.	Understand Corporate Laws - Explore the regulatory framework governing					
	businesses and corporate ethics.					
Cours	e Outcomes: After Successful completion of course units, students will					
CO1	Define the fundamental concepts of Universal Human Values (UHV).	BTL1				
CO2	Understand the significance of ethical values and human relationships in	BTL2				
	society.	l				
CO3	Apply ethical dilemmas and decision-making frameworks in professional	BTL3				
	contexts.	l				
CO4	Analyze the fundamental rights, duties, and governance structure of India.	BTL4				
CO5	Analyze key aspects of corporate laws and ethical business practices.	BTL4				

Syllabus							
Unit I	Introduction to Universal Human Values (UHV)	6 Hrs					
Meaning a self-explor	Meaning and importance of UHV, ethical values, role in personal and professional life, self-exploration.						



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Unit II	Human Relationships & Harmony	6 Hrs					
Role of re	elationships in family, society, and workplace; conflict						
resolution; social responsibility; sustainability in human interactions.							
Unit III	Ethical Decision-Making	6 Hrs					
Case studies on ethical dilemmas, corporate ethics, moral reasoning, frameworks for ethical decision-making.							
Unit IV	Constitution of India	4 Hrs					
Fundamen constitutio	Fundamental rights and duties, directive principles, governance structure, significance of constitutional amendments, case laws.						
Unit V	Corporate Laws & Business Ethics	4 Hrs					
Overview responsibi	of business laws, corporate governance, ethical leadership, corporative (CSR), impact of regulations on industries.	te social					
Text Books:							
1. Shradha Sustainabi	1. Shradha Sinha, Meet Kamal, Vandana Grover, Textbook of Environmental Studies and Sustainability ,Publisher: AITBS Publishers, India,ISBN: 9789374736982,2024.						

2.Suriyanarayanan Sarvajayakesavalu, Pisit Charoensudjai, Environmental Issues and Sustainable Development Publisher: IntechOpen Year: 2021ISBN: 9781838809171,2021.

Reference Books:

1.Sustainable Development and Environmental Stewardship: Global Initiatives Towards Engaged SustainabilityEditor: Satinder Dhiman,Publisher: Springer, ISBN: 9783031288845,2023.

2.Somnath Hazra, Anindya Bhukta Sustainable Development Goals: An Indian Perspective, Publisher: Springer, ISBN: 9783030950538,2022

Other Resources:

Website: https://sdgs.un.org/goals# https://unstats.un.org/sdgs/indicators/indicators-list/ https://sdgs.un.org/publications/sdg-good-practices-2020 https://unstats.un.org/sdgs/iaeg-sdgs/tier-classification/ https://unstats.un.org/UNSDWebsite/undatacommons/countries?p=country/IND https://unstats.un.org/sdgs/report/2022/extended-report/

Component	Parameters	Marks	Total	Pass
CCA	Viva Voce for assessment of Understanding	20		
	Involvement, Participation, and Engagement	10	50	20
	Quality of Submission of Report	10		

Scheme for Theory Evaluation



(Construction)				
	Attendance	10		
End	Performance (Internal)	25	50	20
Evaluation	Oral Examination (Internal)	25	30	20

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	2	3	3
CO3	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	-	-	-	-	-	-	-	3	3	3

3: High, 2: Moderate, 1: Low, 0/-: No Mapping



B Tech in AI & DS Engineering | S Y B Tech Semester IV (2024 COURSE)

Course	Course Category Non Credit Course						AD124NC412				
Course	Title			MOOCs		-					
	Teach	ing Sche	me		Evaluation Scheme						
					Theor	y Marks	Practical Marks				
L (Hr)	T (Hr)	P (Hr)	Cr	Exam	Max %	Min for Passing	Max	Min Marks for Passing			
- Total	- Hours: 26	2	-	CCE	50	20	-	-			

Prerequisites: Basic English Grammar Skills

Objective: After Successful completion of course units, students will be able to

1. Understand and articulate the key principles, theories, and frameworks of Course, and apply them effectively to real-world contexts.

2. Gain proficiency in specific tools, methods, or techniques, and use them to analyze, design, and implement solutions to complex challenges in Domain.

3. Evaluate information critically, make informed decisions, and leverage additional resources for continuous growth and innovation in Domain.

Course Outcomes: After Successful completion of course units, students will								
CO1	Demonstrate a clear understanding of the core principles, theories, and frameworks	BTL3						
	of Course.							
CO2	Solve practical problems by applying the concepts, techniques, and tools learned	BTL3						
	during the course.							
CO3	B Exhibit competence in technical skills/methodologies or tools essential to Domain.							
CO4	Identify resources, strategies, and pathways for further study and continuous	BTL4						
	professional development in Domain.							
CO5	Critically assess case studies, scenarios, or datasets to make informed and	BTL5						
	evidence-based decisions.							

Guidelines

1. Course Duration: The course will run for **12 weeks**, and students must complete all modules, assignments, and quizzes within this timeframe.

2. Passing Criteria: Students must secure a minimum of 20 marks out of 50 to pass the course.

3. Mandatory Registration Submission: Students must submit proof of their MOOC course registration to their assigned faculty within the first two weeks of the course.

4. Certificate Submission: Upon course completion, students must submit the **completion certificate** from the MOOC platform to their respective faculty.

5. Course Presentation: Students must deliver a **presentation** summarizing their learnings and key takeaways from the completed MOOC course as part of the final evaluation. *While selecting Course students should check:*



1. Relevance to Academic Goals: Choose courses that align with your semester's subjects or future career aspirations.

2. Course Provider Reputation: Prefer platforms like Coursera, edX, Udemy, and Khan Academy for credible courses.

3.Accreditation & Certification: Check if the course provides certification and whether it is recognized by employers or universities.

4. Instructor Profile: Verify the instructor's credentials and teaching experience.

5. Content Depth and Quality: Ensure the syllabus matches your knowledge level and is neither too basic nor too advanced.

6. Interactivity and Assessments: Courses with assignments, quizzes, and forums enhance learning.

7. Time Commitment: Evaluate the weekly effort required and ensure it fits your schedule.

- 8. Tips for Maximizing Learning:
 - i. Work on hands-on projects to demonstrate your skills.
 - ii. Actively participate in online forums like Reddit, Stack Overflow, and AI communities.
 - iii. Create a strong LinkedIn profile and highlight completed courses and projects.
 - iv. Practice explaining your projects during mock interviews to enhance placement readiness.

Suggsted Platforms

1. Kaggle: <u>https://www.kaggle.com/learn</u>

- 2. Google AI: <u>https://ai.google/education</u>
- 3. freeCodeCamp: <u>https://www.freecodecamp.org</u>
- 4. Khan Academy: <u>https://www.khanacademy.org</u>
- 5. edX (Audit Mode): <u>https://www.edx.org</u>
- 6. Coursera (Audit Mode): <u>https://www.coursera.org</u>
- 7. Google Cloud Skills Boost: <u>https://www.cloudskillsboost.google</u>
- 8. CS50's Free Programming Hub: <u>https://cs50.harvard.edu/x/</u>
- 9. Hugging Face: https://huggingface.co/learn/nlp-course
- 10. Mode Analytics: https://mode.com/sql-tutorial/
- 11. DataCamp (Free Plan): <u>https://www.datacamp.com</u>
- 12. LinkedIn Learning (Free with Trial): https://www.linkedin.com/learning
- 13. MIT OpenCourseWare: https://ocw.mit.edu
- 14. Tableau Public: https://public.tableau.com/en-us/s/
- 15. OpenCV Tutorials: https://docs.opencv.org/master/d6/d00/tutorial_py_root.html
- 16. HackerRank: https://www.hackerrank.com

Application Areas

- 1. Artificial Intelligence (AI) and Machine Learning (ML)
- 2. Data Science and Big Data Analytics
- 3. Cloud Computing
- 4. Internet of Things (IoT)
- 5. Cybersecurity
- 6. Blockchain Technology
- 7. Augmented Reality (AR) and Virtual Reality (VR)
- 8. Full-Stack Web Development
- 9. 3D Printing and Additive Manufacturing
- 10. Renewable Energy Technologies

Sample Platforms:

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1. Kaggle: https://www.kaggle.com/learn

- 2. Google AI: https://ai.google/education
- 3. freeCodeCamp: https://www.freecodecamp.org
- 4. Khan Academy: https://www.khanacademy.org
- 5. edX (Audit Mode): https://www.edx.org
- 6. Coursera (Audit Mode): https://www.coursera.org
- 7. Google Cloud Skills Boost: https://www.cloudskillsboost.google
- 8. CS50's Free Programming Hub: https://cs50.harvard.edu/x/
- 9. Hugging Face: https://huggingface.co/learn/nlp-course
- 10. Mode Analytics: https://mode.com/sql-tutorial/
- 11. DataCamp (Free Plan): https://www.datacamp.com
- 12. LinkedIn Learning (Free with Trial): https://www.linkedin.com/learning
- 13. MIT OpenCourseWare: https://ocw.mit.edu
- 14. Tableau Public: https://public.tableau.com/en-us/s/
- 15. OpenCV Tutorials: https://docs.opencv.org/master/d6/d00/tutorial_py_root.html
- 16. HackerRank: https://www.hackerrank.com

Additional Resources:

Kaggle Datasets and Competitions: Work on real-world datasets for practical exposure. GitHub: Host your projects to showcase to recruiters.

OpenCV Tutorials: For computer vision enthusiasts.

HackerRank: Practice coding and algorithm problems.

Examination Scheme:

Component	Level	Parameters	Marks	Total	Passing
Continuous	Progressive	Understanding Viva Voce	20	50	20
Comprehensive	Evaluation	Involvement, Participation, and	10		
Evaluation(CCE)		Engagement			
		Quality of Submission of Report	10		
		Attendance	10		
	End	Performance	NA	NA	NA
	Evaluation	Oral Examination	NA		

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	1	3	-	2	3	2	2
CO2	-	2	-	-	-	-	3	1	-	-	2	3	3	2
CO3	-	-	2	-	-	1	3	3	1	3	2	3	2	3
CO4	-	-	-	2	-	-	3	1	-	2	2	2	2	3
CO5	-	-	-	-	2	-	2	2	1	1	3	2	3	2

3: High, 2: Moderate, 1: Low, 0/-: No Mapping



B Tech in AI & DS Engineering | S Y B Tech Semester IV (2024 COURSE)

Cou Category	irse 7	Non Credi Massive Open Online Course	t	Course Code		AD	124NC	413			
Course T	Title		Profession Communi	Professional and Technical Communication							
	Т	eaching Sch	eme		Evaluation Scheme						
					The	eory Marks	s Practical Marks				
L (Hr)	T (Hr)	P (Hr)	Cr	Exam	Max %	Min for Passing	Max %	Min Marks for Passing			
- Total Ho	- urs :26	2	-	ССЕ	-	-	50	20			

Prerequisites: Basic English Grammar Skills								
Obje	ctive: After Successful completion of course units, students will be able to							
CO1	Articulate and evaluate spoken information critically for understanding the context	BTL2						
	and credibility of the source.							
CO2	Demonstrate effective interpersonal communication skills for harmonious and	BTL3						
	productive interactions							
CO3	D3 Analyze strategies for clear and coherent writing skills for personal & professional							
	communication needs							
CO4	Transform skills for effective and authentic non-verbal communication to ace the	BTL4						
	professional communication needs							
CO5	Develop complex problem solving skills- aptitude problems efficiently, improving	BTL5						
	selection test performance.							

Syllabus										
Unit I	Development of Listening and Speaking Skills 04 Hrs									
Introduction for main vocabulary Removing	Introduction to Listening skills, Barriers to Listening skills, active Listening techniques, Listening for main ideas and details, Note taking strategies. Introduction to Speaking skills, Building vocabulary and fluency, Conversational Skills, Public speaking fundamentals. Speed and Fluency, Removing MTI.									
Unit II	Development of Writing and Reading Skills	03 Hrs								

Introduction to Effective Written Communication, fundamentals of grammar and punctuation, Paragraph Structure, Essay writing, Report writing, Formal letter writing. Importance of Reading, Comprehension and solving case studies, Synthesis writing



Unit III	Fundamentals of Technical Communication	03 Hrs								
What is Non-verba Shaking h Smiling or	What is communication? Importance of communication, Communication Types – Verbal, Non-verbal, Why is non-verbal communication important? Making eye contact (or lack thereof), Shaking hands, -Crossing or uncrossing legs, Folding or unfolding arms, Fidgeting, Eye contact, Smiling or frowning, Communication styles									
Unit IV	Business Communication	03 Hrs								
Business communication theory, Email Etiquette, Digital Communication, Presentation Skills, Ethics in Business Communication, Kinesics and Pitch modulation										
Unit V	Quantitative Aptitude	02 Hrs								
Recap & T	Fime and Work									
Unit VI	Reasoning Ability	08 Hrs								
 Coding Data Int Cubes & 	 3. Coding and Decoding & Odd Man Out 4. Data Interpretation - Advanced 5. Cubes & Dices 									
Unit VII	Career Skills	03 Hrs								
1. Network 2. Linked 1 3. ATS Rea	ting Skills In Profile Building & Internship Outreach sume									
Text Book	s:									
1. Co	mmunication Skills for Engineers by S. Mishra & C.Muralikrishna (131799905 9788131799901	Pearson),2011, ISBN								
2. Co	mmunication Skills for Technical Students by T.M. Farhathullah (Or 3N - 9788125022473	rient Longman)2002,								
3. Wr	itten Communication in English by Saran Freeman (Orient Longman)) 1977, 8125004262								
4. Es ISE	sential English Grammar (Elementary & Intermediate) Raymond M 3N 10-8175960299	Aurphy (CUP), 1990,								
Reference	Books:									
1. Co ISH	mmunication for Business: A Practical Approach by Shirley Tail 3N - 9780273687658	lor (Longman),2005,								
2. De	veloping Communication Skills by Krishna Mohan & Meera Baner 3N - 9780230638433	ji (Macmillan),2009,								
3. Bu	siness Correspondence and Report Writing, R. C. Sharma & K	rishna Mohan (Tata								
4. Tec 3rd	chnical communication: Principles and practice, Raman, Minakshi, ed. Oxford University Press, 2015, ISBN - 978-0199457496	and Sangita Sharma.								
MOOCs:										

D Y PATTIL COLLEGE OF ENGINEERING, AKURDI

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- 1. NPTEL Course-Business English Communication IIT Madras,Link https://youtu.be/GwF4ypDSr-A
- 2. NPTELCourse-Introduction to Effective Communication, Link <u>https://archive.nptel.ac.in/courses/109/104/109104030/</u>

Scheme for Practical Evaluation

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Component	Level	Parameters	Marks	Total	Passing
Continuous Comprehensive	Progressive Evaluation	Understanding Viva Voce	20	50	2
Evaluation(CCE)		Involvement, Participation, and Engagement	10		
		Quality of Submission of Report	10		
		Attendance	10		
	End	Performance	NA	NA	NA
	Evaluation	Oral Examination	NA		

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	1	1	1	2	2	2	3	2	2	1	1	1
CO2	1	2	2	1	1	3	3	3	3	2	2	1	2	1
соз	1	1	2	1	1	2	2	2	3	2	2	1	1	1
CO4	1	1	2	1	1	3	3	3	3	2	2	1	1	1
CO5	3	3	2	2	2	1	1	2	2	2	3	3	3	2

3: High, 2: Moderate, 1: Low, 0/-: No Mapping