

B. Tech. Scheme of Examination & Syllabus 2023-24

ARTIFICIAL INTELLIGENCE

Cours	se Code	Course	e Name	Th	Tu	Pr	Credits		Eval	uation	
	A1204T	Annelia d Ma	themetice III	_			2	CA		ESE	Total
23.	AI301 I	Applied Ma	thematics-III	3	-	-	3	30		70	100
		Course Objectiv	es				Cour	se Outcon	nes		
							eeu				
The aim	n of this co	ourse is		C	n comp	oletion	of syllabus, s	students wi	ll be at	ole to	
	- /										
•	l o famil	iarize the students with	concepts in linear		•	Identif	/ Engineerin	g problems	s relate	ed to Matr	ICES:
•	To provi	de students standard o	concepts of statistics.		•	Apply	arious conc	epts of vec	tor spa	aces.	ances.
					•	Apply	he concepts	of advanc	ed line	ar algebra	a.
					•	Use st	atistical met	hods and to	ols in	engineeri	ng
					-	proble	ns. nizo the enti	mization fo	rmulati	iono	
					•	Recoy	nize trie opti	mization io	mulau	0115.	
Unit I											[7Hrs]
Linear o	dependen	ce of vectors, Characte	eristics equation, Eigen	values	s and E	igen ve	ctors, Redu	ction to dia	gonal f	orm, Sylv	ester's
theorem	n.										
l Init II											
Unit II											louisi
Vector	Space, Su	Ibspaces. Linear Depe	ndence/Independence	. Basis	. dimer	ision. L	near transfo	rmation. R	ande S	Space and	Rank.
Null Spa	ace and N	Iullity, Rank nullity theo	prem.	,	,	,		,	J		,
		-									
Unit III											[6Hrs]
lan ar Di	na du at Cia		al anta Oram Calmia	م ماند م							-
Inner Pi and Sin	roduct Sp	aces, Norm, Orthonorn	nal sets, Gram -Schmid	at ortho	gonaliz	ation p	rocess, proj	ections, po	sitive d	iefinite ma	atrices,
	igulai vali	de Decomposition.									
Unit IV	/										[7Hrs]
Mean, M	Median, N	lode, Mean deviation, S	Standard deviation, Hy	pothes	is, Null	hypoth	esis, Alterna	tive hypoth	nesis, T	Festing a	
hypothe	esis, t-test	, F-test and Chi square	e test. One way and two	o-way	analysi	s of va	iance (ANO	VA).			
Unit V											[7Hrs]
0											[]
Continu	Jous optim	nization, Optimization u	sing Gradient descent	, Const	trained	optimiz	ation and La	agrange's n	nultiplie	ers, Conv	ex
optimiza	ation, Sim	plex method.									
Taxt Dr	aaka										
		Titlo		Author	·e		Editio	n		Publis	hor
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1	Higher I	Engineering Mathemati	cs B.S. Gre	wal			40th		Khar	nna Public	cation
2	l inear /	Jaebra	Hoffman	and K	ับกรอ				Prop	tice Hall a	ofIndia
<u> </u>		uyebia			ia kunze -		-		New	Delhi	n mula,
									INCW	Donn	
3 Convex optimization Stephen Bo		Boyd	and		-		Cam	bridge Ur	niversity		
			Lieven V	anden/	berghe				_	-	
									Pres	SS.	
			wohpand	e		1.	10 2024	1	n	A	able C
	6	~~~	<i>d</i>			JL	ny 2024	1.1	J	Applic	able for
	Chairr	nan - BoS	Dean – Acade	mics		Date	of Release	Vers	ion	202	24-25
L											



B. Tech. Scheme of Examination & Syllabus 2023-24

ARTIFICIAL INTELLIGENCE

S.N	Title	Authors	Edition	Publisher
1	A Text Book of applied Mathematics- Volume II	P.N. Wartikar & J.N. Wartikar	2 nd	Poona Vidyarthi Griha Prakashan
2	A text book of Engineering Mathematics	N. P. Bali & M. Goyal	-	Laxmi Publication.
3	Probability, Statistics with Reliability, Queuing and Computer Science Applications	K.S. Trivedi	-	-

and	workpande	July 2024	1.0	Applicable for
Chairman - BoS	Dean – Academics	Date of Release	Version	2024-25



B. Tech. Scheme of Examination & Syllabus 2023-24

ARTIFICIAL INTELLIGENCE

Z3AI302T Data Structures 3 - 3 CA ESE Total 100 Course Objectives This course is intended to Learn various static and dynamic representations of data structures in implementing Stack applications Design fundamental algorithmic problems of various container data structures in implementing Stack applications Familar with Oraph represensation and traversals Know the basic concepts of Hashing. Students will be able to Design and realize linear data structures (stacks, queues, linked lists) and analyze their complexity. Design and realize linear data structures (stacks, queues, linked lists) and analyze their complexity. Design and realize linear data structures (stacks, queues, linked lists) and analyze their complexity. Design through the basic concepts of the stack and the stack	Course Code	Course	e Name	Th	Tu	Pr	Credits		Evaluat	ion
Course Objectives Course Outcomes This course is intended to Exam various static and dynamic representations of deal structures Students will bable to • Learn various static and dynamic representations of deal structures Students will be able to • Recognize different ADTs and their operations and applications inonitered rates structures. • Familiar with Graph representations and deal structures Familiar with Graph representations and traversities. Examine State: and Dynamic data structures (stacks, queues, linked lists) and analyze their computation complexity. Design and realize linear data structures (stacks, queues, linked lists) and analyze their time and space requirements • Design traversal and path finding algorithms for Trees and Graphs • Design traversal and path finding algorithms for Trees and Graphs • Analyze and Design Heash Functions IMHT: Introduction [SHrs] Basic terminologies, elementary data organizations, data structure operations; abstract data types (ADT) and their characteristics. Algorithms: difficulton, characteristics, analysis of an algorithm, asymptic notations, time and space trade- offs. Array ADT: definition, operations and representations- row-major and column-major. Stack and Queues. Unit I: Introduction [Stuffs] [AHrs] Representation in memory, algorithms of several operations, algorithms and their complexity analysis, algorithms and priority queues. [AHrs] Unit II: Incked Lists Singly Linked Lists: operations, and algorithms of several operations, algorith	23AI302T	Data St	ructures	3	-	-	3	CA 30	ESE 70	Total
Course Objectives Course Outcomes This course is intended to • Learn various static and dynamic representations of data structures Students will be able to • Design fundamental algorithmic problems of various nonlinear data structures. • Recognize different ADTs and their operations and applications • Familiar with Graph prosensations and raversals. • Know the basic concepts of Hashing. • Design and realize linear data structures (stacks, queues, linked lists) and analyze their complexities. • Duesign fundamental distributive, and tree base(Jack example). • Design fundamental and-conquer, distributive, and tree base(Jack example). • Duesign fundamental distributive, and tree base(Jack example). • Design fundamental example different sorting (comparison based, divide- and-conquer, distributive, and tree base(Jack example). • Duesign traversal and path finding algorithms for Trees and Graphs • Analyze and Design Hash Functions • Interview of the distribution, characteristics, analysis of an algorithm, asymptotic notations, time and space trade- stributive analysis, multiple stacks. • Markan Queues Stack ADT: allowable operations, algorithms and their complexity analysis, applications of stacks – expression conversion and evaluation (algorithm insention, Shelf queue, Introduction to double-ended queues and priotity queues. • Unit II: Introduction Trees and circular queue, introduction to double-ended queues and priotity queues. • Market ADT: andowable operations, Algorithms, insention, Algorithm insention, Algorithms, insenti				I				30	10	100
This course is intended to Students will be able to Learn various static and dynamic representations of data structures. Pesign fundamental algorithmic problems of various nonlinear data structures. Familar with Graph representations and traversals. Know the basic concepts of Hashing. Design fundamental algorithmic problems of various nonlinear data structures. Familar with Graph representations and traversals. Know the basic concepts of Hashing. Design and realize linear data structures (stacks, and conquery, distributive, and analyze their complexity. Devise different starting (inear, binary) methods and analyze their time and space requirements Design traversal and path finding algorithms for Trees and Graphs Analyza and Design Hash Functions Unit I: Introduction [Shris] Basic terminologies, elementary data organizations, data structure operations; abstract data types (ADT) and their dinvalue operations and their complexity analysis, applications of stacks –expression conversion and evaluation (algorithm: analysis), applications of stacks –expression conversion and evaluation (algorithm: analysis), applications of stacks –expression conversion and evaluation (algorithm: data); applications of stacks and prevention and circular queue, introduction to double-ended queues and priority queues. Unit I: Linked Lists Singly Linked Lists: operations; and algorithmic analysis of search methods. Unit II: Linked Lists: operations, binary search tree [BST] and operations, Bearching, celering, datacteristics, and operations, binary search tree (BST] and operations, Bearchings, characteristics. Unit II: Sorting and Searching Sorting<td></td><td>Course Objective</td><td>6</td><td></td><td></td><td></td><td>Course</td><td>Outcome</td><td>S</td><td></td>		Course Objective	6				Course	Outcome	S	
Learn various static and dynamic representations of dida structures Design fundamental algorithmic problems of various nonlinear data structures. Familiar with Graph representations and traversals. Know the basic concepts of Hashing. Design and realize linear data structures (stacks, queues, linked lists) and analyze their computation comparity. Devise different sorting (comparison based, division based, division based, division based, division based, division based, division based, and searching (inear, binary) methods and analyze their time and space requirements Design traversal and path finding algorithms for Trees and Graphs Analyze and Design Hash Functions The complexity analysis, data structures operations, above that structures operations, shore and their complexity analysis, applications, data structure operations; abstract data types (ADT) fifther characteristics. Algorithm: divisions and their complexity analysis, applications of stacks area expression conversal on algorithms and their complexity analysis, applications of stacks area expression conversal, ordening, text and queue, stack ADT: allowable operations, algorithms and their complexity analysis, applications of stacks area derived analysis) multiple stacks. Queue ADT: allowable operations, algorithms and their complexity analysis for simple queue and circular queue, introduction to double-ended queues and priority queues. Unit II: Linked Lists: operations and algorithmic analysis. Linked representation of stacks and queues, header node linked list. Unit III: Sorting and Searching Sorting Inter Trees: tree rotations, AVL tree and operations, Bearching: necessity of a robust search mechanism, searching linear lists (linear search binary search) and complexity analysis of algorithmics, thread binanic, search methods (division method, mid-square method, floding), collision resolution techniques Introduction in memory algorithms. Inter complexity analysis, path finding (Dijkstra'SSSP, Floy	This course is in	ntended to		Stud	ents w	ill be a	ble to			
Unit I: Introduction [5Hrs] Basic terminologies, elementary data organizations, data structure operations; abstract data types (ADT) and their characteristics. Algorithms: definition, characteristics, analysis of an algorithm, asymptotic notations, time and space trade- offs. Array ADT: definition, operations and representations– row-major and column-major. Stacks and Queues Stack ADT: allowable operations, algorithms and their complexity analysis, applications of stacks –expression conversion and evaluation (algorithmic analysis), multiple stacks. Queue ADT: allowable operations, algorithms and their complexity analysis for simple queue and circular queue, introduction to double-ended queues and priority queues. [4Hrs] Net I: Linked Lists Singly Linked Lists [4Hrs] Representation in memory, algorithms of several operations: traversing, searching, insertion, deletion, reversal, ordering, etc. Doubly and Circular Linked Lists: operations and algorithmic analysis. Linked representation of stacks and queues, header node linked list. [4Hrs] Unit II: Sorting and Searching Sorting [4Hrs] Algorithms (insertion, Shell, quick, merge, heap, counting), performance analysis and comparison. Searching: necessity of a robust search mechanism, search ing linear lists (linear search, binary search tree [BST] and operations with time analysis of algorithms, threaded binary trees. Self-balancing Search Trees: tree rotations, AVL tree and operations, B+-tree: definitions, characteristics, and operations (introductory). Unit V: Graphs and Hashing Graphs [5Hrs] Representation of graphs, traversals (DFS, BFS) with complexity analysis, path finding (Dijkstra'sSSSP,	 Learn various static and dynamic representations of data structures Design fundamental algorithmic problems of various nonlinear data structures. Familiar with Graph representations and traversals. Know the basic concepts of Hashing. 			•	Rea spe Dyn app De cor De and sea tim De Tre Ana	cogniz ecify t namic blicatio sign a eues, l nplexit vise di d-conq arching e and s sign tu es and alyze a	e different heir comp data struc ns nd realize inked lists) y. fferent sort uer, distrik (linear, bin space requi aversal an d Graphs nd Design I	ADTs and lexities. ctures in linear da and ana ing (comp outive, a nary) meth rements nd path Hash Fun	d their op Examine implement ata struct lyze their parison b and tree- nods and finding a ctions	erations and Static and enting Stack ures (stacks, computation ased, divide- based)and analyze their Igorithms for
Intersection Image: Control Basic terminologies, elementary data organizations, data structure operations; abstract data types (ADT) and their characteristics. Algorithms: definition, characteristics, analysis of an algorithm, asymptotic notations, time and space trade-offs. Array ADT: definition, operations and their complexity analysis, applications of stacks —expression conversion and evaluation (algorithmic analysis), multiple stacks. Queue ADT: allowable operations, algorithms and their complexity analysis, applications of stacks —expression conversion and evaluation (algorithmic analysis), multiple stacks. Queue ADT: allowable operations, algorithms and their complexity analysis for simple queue and circular queue, introduction to double-ended queues and priority queues. Unit II: Linked Lists Singly Linked Lists [4Hrs] Representation in memory, algorithms of several operations: traversing, searching, insertion, deletion, reversal, ordering, etc. Doubly and Circular Linked Lists: operations and algorithmic analysis. Linked representation of stacks and queues, header node linked list. [4Hrs] Unit II: Sorting and Searching Sorting [4Hrs] Algorithms (insertion, Shell, quick, merge, heap, counting), performance analysis and comparison. Searching: necessity of a robust search mechanism, searching linear lists (linear search, binary search and operations, B+-tree: definitions, characteristics, and operations (bintroductory). Unit V: Trees [5Hrs] Representation of graphs, traversals (DFS, BFS) with complexity analysis, path finding (Dijkstra'sSSSP, Floyd's APSP), and spanning tree (Prim's method) algorithms. Hashing: hash fu	Unit I: Introduct									[5Hre]
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Representation in memory, algorithms of several operations: traversing, searching, insertion, deletion, reversal, ordering, etc. Doubly and Circular Linked Lists: operations and algorithmic analysis. Linked representation of stacks and queues, header node linked list. Unit III: Sorting and Searching Sorting [4Hrs] Algorithms (insertion, Shell, quick, merge, heap, counting), performance analysis and comparison. Searching: necessity of a robust search mechanism, searching linear lists (linear search, binary search) and complexity analysis of search methods Unit IV: Trees [5Hrs] Tree terminologies, binary tree and operations, binary search tree [BST] and operations, B+-tree: definitions, characteristics, and operations (introductory). Unit V: Graphs and Hashing Graphs [5Hrs] Representation of graphs, traversals (DFS, BFS) with complexity analysis, path finding (Dijkstra'sSSSP, Floyd's APSP), and spanning tree (Prim's method) algorithms. Hashing: hash functions and hash tables, closed and open hashing, randomization methods (division method, mid-square method, folding), collision resolution techniques	Unit II: Linked L	ists Singly Linked Lis	ts							[4Hrs]
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Algorithms (insertion, Shell, quick, merge, heap, counting), performance analysis and comparison. Searching: necessity of a robust search mechanism, searching linear lists (linear search, binary search) and complexity analysis of search methods Unit IV: Trees [5Hrs] Tree terminologies, binary tree and operations, binary search tree [BST] and operations with time analysis of algorithms, threaded binary trees. Self-balancing Search Trees: tree rotations, AVL tree and operations, B+-tree: definitions, characteristics, and operations (introductory). Unit V: Graphs and Hashing Graphs [5Hrs] Representation of graphs, traversals (DFS, BFS) with complexity analysis, path finding (Dijkstra'sSSSP, Floyd's APSP), and spanning tree (Prim's method) algorithms. Hashing: hash functions and hash tables, closed and open hashing, randomization methods (division method, mid-square method, folding), collision resolution techniques July 2024 1.0 Applicable	Unit III: Sorting	and Searching Sorting	g							[4Hrs]
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Tree terminologies, binary tree and operations, binary search tree [BST] and operations with time analysis of algorithms, threaded binary trees. Self-balancing Search Trees: tree rotations, AVL tree and operations, B+-tree: definitions, characteristics, and operations (introductory). Unit V: Graphs and Hashing Graphs [5Hrs] Representation of graphs, traversals (DFS, BFS) with complexity analysis, path finding (Dijkstra'sSSSP, Floyd's APSP), and spanning tree (Prim's method) algorithms. Hashing: hash functions and hash tables, closed and open hashing, randomization methods (division method, mid-square method, folding), collision resolution techniques July 2024 1.0 Applicable	Unit IV: Trees	ionamorn, ocaroning in			oouron) and c				[5Hrs]
Unit V: Graphs and Hashing Graphs [5Hrs] Representation of graphs, traversals (DFS, BFS) with complexity analysis, path finding (Dijkstra'sSSSP, Floyd's APSP), and spanning tree (Prim's method) algorithms. Hashing: hash functions and hash tables, closed and open hashing, randomization methods (division method, mid-square method, folding), collision resolution techniques Mathematic July 2024 1.0	Tree terminologie threaded binary t characteristics, a	es, binary tree and oper rees. Self-balancing Se nd operations (introduc	ations, binary search tr earch Trees: tree rotati tory).	ee [BS ons, A\	T] and /L tree	operat and op	ions with tin perations, B	ne analysi +-tree: de	is of algor efinitions,	ithms,
Representation of graphs, traversals (DFS, BFS) with complexity analysis, path finding (Dijkstra'sSSSP, Floyd's APSP), and spanning tree (Prim's method) algorithms. Hashing: hash functions and hash tables, closed and open hashing, randomization methods (division method, mid-square method, folding), collision resolution techniques July 2024 1.0	Unit V: Graphs	and Hashing Graphs								[5Hrs]
Hashing: hash functions and hash tables, closed and open hashing, randomization methods (division method, mid-square method, folding), collision resolution techniques Image: the second seco	Representation o spanning tree (Pr	f graphs, traversals (DI im's method) algorithm	FS, BFS) with complexi s.	ty anal	ysis, pa	ath find	ing (Dijkstra	a'sSSSP,	Floyd's Al	PSP), and
July 2024 1.0 Applicable	Hashing: hash fe method, folding),	unctions and hash tabl collision resolution tec	es, closed and open h hniques	ashing,	randoi	mizatic	on methods	(division	method, r	nid-square
Chairman - BoS Dean – Academics Date of Release Version 2024-25	Chair	man - BoS	Dean - Acade	<u>و</u> mics		Ju	uly 2024 of Release	e Ve	1.0 ersion	Applicable fc 2024-25



B. Tech. Scheme of Examination & Syllabus 2023-24

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ARTIFICIAL INTELLIGENCE

Sr.	Title	Authors	Edition	Publisher
No.				
1.	Fundamentals of Data	Horowitz and Sahani,	2 nd	Galgotia Publications
	Structures in C			
2.	Data Structure with C	Seymour Lipschutz, Schaum's Outlines	2 nd	Tata McGraw-Hill.
3.	Data structures and Algorithm Analysis in C	Mark Allen Weiss	2nd	Pearson

Refer	ence Books			
Sr. No.	Title	Authors	Edition	Publisher
1.	Data Structures- A Pseudo code Approach with C	Richard F Gillberg & Behrouz A. Forouzan	2 nd	Cengage Learning,
2.	Data Structures Using C and C++,	Aaron M. Tanenbaum, Yedidyah Langsam and Moshe J. Augenstein,	2 nd	PHI Learning Private Limited, Delhi India.
3.	Data Structures & Algorithms using C	R.S. Salaria	5 th	Khanna Publishing House.

and	workpande	July 2024	1.0	Applicable for
Chairman - BoS	Dean – Academics	Date of Release	Version	2024-25



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B. Tech. Scheme of Examination & Syllabus 2023-24

ARTIFICIAL INTELLIGENCE

THIRD SEMESTER

Course (Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
230130	2P	Data Structures Lab	_	_	4	2	CA	ESE	Total
ZJAIJU	21	Data Officiales Lab			-	2	25	25	50
		Course Objectives				Course Ou	tcomes		
This cour • [r • [• [• [• • [• [• • [• [• [• [• [• [• [• [• [• [• [• [• [• [• [• [• [• [• [• • [• • [• • [•	rse is ir Design a Design a Design a algorithr dentify or the g	ntended to and analyze simple linear and ar data structures. and implement various data structure ns and apply the suitable data structure iven real world problem	Students D • D • D • D • D • D • D • D	will be evelop emons ees. esign a raph T evelop	able to the pro- strate the and im raversa the pro-	ograms on s he impleme plementatic als. ograms on l	stacks an ntation o n of prog Hashing a	d its applica f various a grams on B and Dictiona	ations. dvanced ST and aries
Sr. No.	List	of Practicals							
1	Write Sort)	a program to compare the time complex on datasets of varying sizes.	kity of differe	ent sort	ing alg	orithms (e.g	, Bubble	Sort vs. In	sertion
2	Imple Notat	ment the Stack ADT and develop an alg tion) and evaluate the postfix expression	orithm to co using stack	onvert i is.	nfix ex	pressions to	o postfix (I	Reverse Po	lish
3	Imple overf Queu	ement a Circular Queue using arrays. Wr low and underflow conditions. Compare le.	ite algorithr the space a	ns for e nd time	enqueu e efficie	e and deque	eue oper Circular C	ations, and Queue with a	handle a simple
4	Imple the a	ment a Doubly Linked List and write algo dvantages of a Doubly Linked List over a	orithms for i a Singly Linl	nsertio ked List	n, dele t in terr	tion, and tra	iversal op tion comp	erations. D lexity.	iscuss
5	Imple	ement Merge Sort on datasets of differen	t sizes. Per	form a	detaile	d analysis c	of the time	e complexity	<i>.</i>
6	Deve for el is mo	lop a code for Binary Search and Linear ements in large datasets of sorted and u re efficient than Linear Search.	Search alg	orithms ays. An	s. Com alyze t	pare their ti he conditior	me comp ns under v	lexities by s which Binar	searching y Search
7	Desig Perfo	gn a Binary Search Tree (BST) and write rm a time complexity analysis of these o	algorithms perations a	for inse nd disc	ertion, suss the	deletion, an e impact of t	d searchi ree heigh	ng operatio nt on perfori	ns. mance.
8	Cons Bread short	truct a graph using adjacency lists and a dth-First Search (BFS) traversals on the est path in a weighted.	idjacency m graph. Addi	atrices tionally	. Perfo , imple	orm Depth-F ment Dijkst	irst Searc ra's algor	ch (DFS) ar ithm for finc	nd ding the
	Oper	n ended experiments							
9	Creat close	te a hash table using various hash functi d hashing (open addressing) and open h	ons (e.g., di nashing (cha	vision i aining)	methoo technio	d, mid-squa ques.	re method	d) and apply	y both

Text Books

Micro-Project

9 10

Sr. No.	Title	Authors	Edition	Publisher
1.	Data Structure with C	Seymour Lipschutz, Schaum's Outlines	2 nd	Tata McGraw-Hill.
2.	Fundamentals of Data Structures	Horowitz and Sahani,	2 nd	Galgotia Publications
3.	Data structures and Algorithm Analysis in C	Mark Allen Weiss	2 nd	Pearson

Sr. No.	Title	Authors	Edition	Publisher
1.	Data Structures, A Pseudo code Approach with C,	Richard F Gillberg & Behrouz A. Forouzan	2 nd	Cengage Learning,
2.	Data Structures Using C and C++,	Aaron M. Tanenbaum, Yedidyah Langsam and Moshe J. Augenstein,	2 nd	PHI

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Chairman - BoS	Dean – Academics	Date of Release	Version	2024-25



_____ARTIFICIAL INTELLIGENCE_____

ARISE & SHINE

3.	Data Structures & Algorithms using C	R.S. Salaria	5 th	Khanna Publishing House.	
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and	workpande	July 2024	1.0	Applicable for
Chairman - BoS	Dean – Academics	Date of Release	Version	2024-25



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B. Tech. Scheme of Examination & Syllabus 2023-24

ARTIFICIAL INTELLIGENCE

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits		Evaluation	
22 A 12 0 2 T	Fundamentals of Artificial Intelligence	2			2	CA	ESE	Total
23A13031	Fundamentals of Artificial Intelligence	3	-	-	3	30	70	100
	Course Objectives		0. 1.		Cou	rse Outco	mes	
Carter of the second seco	Gain the basics of one of the most fascinat and fastest growing areas of Computer Science formulate artificial intelligence proble corresponding to different applications. Apply artificial intelligence search strategies algorithms to solve the problems. Learn the applications and existing systems Artificial Intelligence in different areas. uction AI, history & importance of AI, AI winter, cur of AI, AI Characteristics, AI Problems and	ing ce ms / cof / cof rrent st its stat	 Lea don Cor Ana Tec Disi Lea of v 	arn the nain. npreh alyze chniquist inguist irn the iew.	e fundamen end the ba the applica- les. sh between e various a agents, er rch, Introd	ntals of Arraisic Al probability of N ability of N n various s spect of k nvironment uction to in	tificial Intelligen plem solving stra various searchi earch strategies mowledge from ts, Turing test of ntelligent agent	ce ategies. ng S. Al point [5Hrs] concept, ts. Case
Unit II Al Pro	l, Dendral blems and its Formulations							[10Hrs
Defining the p system chara Problem solv	problems as a state space search and repres acteristics and Issues in the design of search ing methods -Problem graphs, Matching.	entatio proble	ems, Ad	ductio dition	n to Produ al problem	ction syste s. Speciali	em, it's type, Pro ized production	oduction system,
Unit III Uninf	ormed Search Strategies							[6Hrs]
Search strate uniformed sea	gies, blind search, Breadth-first search, Dep arch techniques. Related Algorithms.	oth-first	search	, Brar	nch and bo	ound algori	thm, Comparing	g
Unit IV Inform	med search strategies							[8Hrs]
Indexing and satisfaction, N	Heuristic functions, Generate-and-test, Hill c Mean-ends analysis. Search and optimizatior	limbing ı (gradi	g, best-f ient des	irst se cent)	earch, prob	lem reduct	tion, constraint	
Unit V Introd	uction Knowledge Representation							[7Hrs]
Knowledge P	rogression, Knowledge model, categories of veen facts and representations, Brief about	variou Issues	is know	ledge	, knowledg	je type, Kl tation, Cas	R system requir	ements,

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1	Artificial Intelligence	Elaine Rich, Kevin Knight, & Shivashankar B Nair	3 rd	McGraw Hill
2	Artificial Intelligence: A Practical Approach	Rajiv Chopra	1 st	S Chand & Co Ltd
3	Artificial Intelligence A modern approach	Stuart Russell, andPeter Norvig	2 nd	Pearson

Sr. No.	Title	Authors	Edition	Publisher
1	Artificial Intelligence	Saroj Kaushik	1 st	Cengage Learning India.
2	A First Course in Artificial Intelligence	Deepak Khemani	6 th	McGraw Hill Education

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
23AI303P	Fundamentals of Artificial Intelligence Lab	-	-	2	1	CA 25	ESE 25	Total 50

Course Objectives	Course Outcomes
 This course is intended To implement the theoretical concepts of Artificial intelligence To compare the efficiency of various AI search algorithms. 	 Students will be able to Comprehend and explore Python programming language. Demonstrate basic AI problem solving strategies. Implement the applicability of various searching Techniques. Evaluate and implement various knowledge representation techniques.

Sr. No.	List of the Practicals
1	Implementation of various AI Problems.
2	Production systems.
3	Uninformed search.
4	Informed search.
5	Constraint satisfaction.
6	Heuristic search procedure.
7	Knowledge representation
8	Course syllabus based Micro Project.
	Open ended practicals
9	Set up a simulated environment where a robot needs to navigate to different locations while avoiding obstacles. Implement the Simulated Annealing algorithm to optimize the robot's path planning considering factors like distance to goal, energy consumption, and obstacle avoidance.
10	Design a maze-solving task where students implement these algorithms and analyze their effectiveness in Finding the optimal path and the computational resources they consume.

Text Books

S. N	Title	Authors	Edition	Publisher
1	Artificial Intelligence	Elaine Rich, Kevin Knight, & Shivashankar B Nair	3 rd	McGraw Hill
2	Artificial Intelligence: A Practical Approach	Rajiv Chopra	1 st	S Chand & Co Ltd
3	A First Course in Artificial Intelligence	Deepak Khemani	6 th	McGraw Hill Education
4	Artificial Intelligence A modern approach	Stuart Russell, and Peter Norvig	2 nd	Pearson

S. N	Title	Authors	Edition	Publisher
1	A Classical Approach to Artificial Intelligence	Munesh Chandra Trivedi	2 nd	Khanna Publishing House Delhi.
2	Artificial Intelligence	Saroj Kaushik	1 st	Cengage Learning India.
3	Artificial Intelligence: Foundations for Computational Agents	David Poole and Alan Mackworth	2 nd	Cambridge University Press.

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Cours Code	e Course l	Name	Th	Tu	Pr	Credits		Evaluatio	on
23AI304	4T Computer Ne	etworking	3	-	-	3	CA	ESE	Total
							30	70	100
	Course Objectives					Course Ou	tcomes		
This co	of computer on network d applications, d modulation.	Idents D b w A c c ill ill W w U Ill tr A la	will be bescribe asis fo vorld ne pply ti ontrol lustrate vireless lustrate ansmis nalyze ayer.	e able to e the co r most o etworks he kno and en e variou e the pr b lan. e the ssions a the fur	o components computer no owledge of ror control s protocols otocols of r different and routing octioning of	and infra etworks. (different during da of data lir nac sub li techniqu at networl transport	structure the Dutline the technique ata transm k layer. ayer with II es for co k layer. layer and	hat form the various real- es of flow ission and EEE 802.11 ligital data application	
				-					
Unit I In	troduction to Computer Ne	tworking Concepts	S	an e !! 4		A/:da A	Nature	. Tala	[5Hrs]
Layered and Cel bandwid	l Network Protocol Architect Iular Networks overview. Ph Ith and bit-error-rate charac	ures; Personal, Loca ysical Layer: Basic cteristics; Wired and	al, Metr s of co d Wirel	opolita mmuni less m	in and ications iedia in	Wide Area ; Physical ı cluding co	Networks nedia typ pper cable	; Telecomr es and the es, optical t	nunications ir important fiber and
wireless	S.					0			
Unit II L sub-lay	Data Link Layer and Logica er	Link Control (LLC)						[4Hrs]
Framing	; Error control including Bit	-parity, CRC and H	lammin	g Code	es; Rel	iable transr	mission a	nd Automa	tic Repeat
protocol	s. Example protocols such a	s HDLC and PPP	Jack-IN,	Selec	live Ke	beat. Peno	mance a	nalysis of A	ARQ
Unit III I	Medium Access Control (M	AC) sub-layer							[4Hrs]
Shared IEEE 80 such as	media systems; Bus, Star an 2.11 including CSMA/CA pro ICMP, NAT, ARP and RARF	d Ring topologies; T tocols; Performance	DMA, I analys	FDMA, is; Sha	CSMA ared and	, CSMA/CD d Switched	, Etherne Ethernet;	t and IEEE Related pro	802.3; otocols
Unit IV	Network Layer								[5Hrs]
Internet	Protocol (IP) suite; Hierarch	cal network archited	tures; I	Pv4 ar	nd IPv6	addressing	and head	ders; Routii	ng protocols
Algorith	g distance-vector and link	-state approaches; hm and distributed F	Interic Sellman	or and	Exteri algorith	or Gatewa m [.] Example	y Protocol	ol concep	IP RGP
Unit V 1	Fransport Laver				aigonai		, biorocor	5. OOI 1 , IX	[5Hrs]
Reliable and con Interface	e end-to-end transmission pro gestion control; TCP variants e and Socket programming; I	tocols; UDP header; s such as Reno, Tah Example protocols si	; Details oe, Veg uch as	s of TC gas, Co DNS, S	P head ompoun SMTP, F	er and oper d and CUB TP, and H	ration inclu IC. Appli TTP.	uding option cation Lay	ns headers er: Socket
ext Book	S								
Sr. No.	Title	Authors	6		Ec	lition		Publish	er
1	Computer Networking - A top- down approach	Kurose and	Ross,			7th		Pearsor	1.
2	Computer Networks	Andrew S. Tane	enbaum	ו ו		5th	Pear	son Educat	ion India.
3	Computer Networks, A Systems Approach	Peterson and	Davie			5th		Elsevie	
4 0	Computer Networks, A Top- Down Approach	Behrouz A. Forouz Mosharra	zan, Fir af	ouz	Sta	indard		McGraw-I	Hill.

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Sr. No.	Title	Authors	Edition	Publisher
1	Computer Networks: An Open-Source Approach	Ying-Dar Liu, Ren- Hung Hwang, Fred Baker	2 nd	McGraw-Hill.
2	Unix Network Programming	W.Richard Stevens, Bill Fenner and Andrew R	3 rd	Addison-Wesley Professional.

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ARTIFICIAL INTELLIGENCE

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		on
23AI305T	Modern Computer Architecture	2	-	-	3	CA	ESE	Total
		3				30	70	100

Course Objectives	Course Outcomes				
 This course is intended Understand the fundamental principles and components of modern computer architecture. Analyze the performance and efficiency of computer systems using quantitative metrics and benchmarks. Evaluate the design trade-offs in processor architecture, memory systems, and input/output interfaces. Apply advanced concepts in parallel computing and multiprocessing to accelerate AI algorithms. Design and optimize computer architectures for specific AI and machine learning tasks. 	 Students will be able to Learn the historical development and key concepts of computer architecture. Analyze organization and operation of central processing units (CPUs) and memory systems. Apply the concepts of pipelining, superscalar execution, and out-of-order execution for various application. Discuss parallel computing architectures, including SIMD, MIMD, and GPU-based systems. Demonstrates hands-on experience with simulation tools and performance analysis techniques. 				
Unit I - Introduction to Computer Architecture	[6Hrs]				
Overview of computer architecture principles and design systems, Instruction set architectures (ISAs) and assemb	methodologies, Historical perspective and evolution of computer ly language programming				

Unit II - CPU Design and Performance

Basic CPU organization and operation, Pipelining and instruction-level parallelism, Branch prediction and speculative execution techniques [8Hrs]

[6Hrs]

[8Hrs]

[10Hrs]

Unit III - Memory Hierarchy and Cache Systems

Memory technologies and hierarchies, Cache organization, replacement policies, and coherence protocols, Virtual memory systems and address translation techniques.

Unit IV - Multiprocessor and Multicore Architectures

Symmetric multiprocessing (SMP) and cache coherence protocols, Multicore processors and thread-level parallelism, Parallel computing architectures and programming models

Unit V - GPU Architecture and Accelerators

Introduction to graphics processing units (GPUs), GPU architecture and parallel computing principles, Accelerators for AI and machine learning workloads.

Emerging Trends in Computer Architecture: - Trends in power efficiency, reliability, and security, Neuromorphic computing and quantum computing architectures.

Text Books

S.N	Title		Authors	Edition	Publisher
1	Computer Organization and Design: The		David A. Patterson and John L.	1 st	Wiley-IEEE
	Hardware/Software Inte	erface	Hennessy		Press
2	Modern Proces	sor Design:	John Paul Shen and Mikko H.	1 st	Pearson
	Fundamentals of Superscalar Processors		Lipasti		
3.	High-Performance	Computer	Harold S Stone	1 st	Pearson
	Architecture				

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Refer	ence Books			
S.N	Title	Edition	Publisher	
1	Computer Architecture: Concepts and Evolution	Gerritt A. Blaauw and	1 st	Morgan
		Frederick P. Brooks Jr.		Kaufmann
2	Parallel Computer Architecture: A	David Culler, Jaswinder Pal	2 nd	Morgan
	Hardware/Software Approach Singh, and Anoop Gupta			Kaufmann
3	Computer Architecture: A Quantitative Approach	John L. Hennessy and David	1 st	Wiley-Blackwell
		A. Patterson		

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THIRD SEMESTER

Course Code	e Code Course Name		Tu	Pr	Credits		Evaluatio	on
23AI306P	Object Oriented Programming Lab	-	-	2	1	CA 25	ESE 25	Total 50
				Course Out	tcomes			
 This course is intended To introduce students to the fundamental concepts of Object-Oriented Programming (OOP) 		Students • Im m	will be plemer nanipula	able t ent basie ate arra	o c algorithms ays and lists	for numb efficientl	oer systems y.	and

To enable students to understand and implement various data structures and

To develop students' proficiency in using C++ as an object-oriented programming language.

To familiarize students with key features of

To teach students how to effectively manage

memory dynamically in C++ programs.

constructors,

algorithms using OOP principles.

C++ such as classes,

overloading, and inheritance.

- Develop sorting algorithms and apply them to various data structures.
 - Design and implement class structures with constructors for creating objects in C++ programs.
 - Utilize friend functions and classes to access private and protected members of a class in C++ programs, proficiency in using pointers for dynamic memory allocation and memory management.
 - Apply exception handling mechanisms to gracefully handle runtime errors and exceptions in C++ programs.

Sr. No.	List of the Practicals
1	Implementation of Number system and array of list.
2	Implementation of sorting and dynamic memory allocation
3	Implementation of class structure and constructor
4	Implementation of overloading in C++.
5	Implementation of Friend function and class in C++.
6	Implementation of Friend function and class in C++.
7	Implementation of Inheritance in C++
8	Implementation of Exception Handling
9	Micro based Project based on studied syllabus.
Open	ended practical
10	Write a program showing implementation of stack class having the functionality of Push and Pop operations.
11	Write a program to implement a queue class with required operations/ functions.
ext Bool	(\$

S.N	Title	Authors	Edition	Publisher
1	The C++ Programming Language	Bjarne Stroustrup	4th	Addison -
				Wesley
2	A Complete Guide to Programming in	Ulla Kirch-Prinz, Peter Prinz	3rd	Jones & Bartlett
	C++			Learning
3.	Let Us C / C++	Yashwantrao Kanetkar	4th	BPB
	1	1		

Refere	nce	Book	(S
C N			

S.N	Title	Authors	Edition	Publisher
1	C Pocket Reference	Peter Prinz, Ulla Kirch-Prinz	1st	O'Reilly Media
	C Syntax and Fundamentals			
2	C++ Black Book	Steven Holzner	2 nd	Paperback

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Cour	se Code	Course Name		Th	Tu	Pr	Credits	Evaluation		า	
22/	\1331M	MDM (Perpapaible A)		2			2	CA	ES	SE Tota	
237				2	-	-	2	15	35	5	50
							<u> </u>				
Course Objectives							Course OL	itcomes			
This c	course is i	ntended	Stu	udents v	will be	able t	0				
•	Underst	and the Fundamentals of AI		• Ex	plain A	I Conc	epts and H	istory			
•	Apply E	thical Principles in Al		• An	alvze I	ntelliae	ent Agents				
				• An	only Eth	ical Re	asoning				
				5 /ip							
				• De	esign E	inical A	AI Systems				
				• Im	plemer	nt Resp	onsible Al	Practices			
nit	- Introduct	tion to Al		_							[/Hre]
Introdu	uction to A	History of AL Applications of A	rtificial In	telligeng			a Al Works	Intelligo	nt ano	nts. V	here stree
Enviro	nments, T	he Concept of Rationality. The Na	ature of E	Environm	nents,	Proper	ties of task	environr	nents,	the S	tructure of
Agent	s, Agent pr	ograms: Simple reflex agents, Mode	el-based	reflex ag	gents, (Goal-b	ased agent	s, Utility-b	ased a	agents	, Learning
agente	S.										
Unit II	- Ethical I	Decision-Making				. <u> </u>			- - · ·		[5Hrs]
Introdu	uction, Eth	nical Theories, Values, Ethics ii	n Practio	CE, IMP		ing E	thical Rea	soning.	laking	Res	ponsibility:
Desig	n for	sponsible Research and Innovatio	n, me <i>F</i>		AI- AC	counta	bility, Resp	DOIISIDIIITY	ααπρ), Hai	isparency,
Values	S.										
Unit II	I – Ethical	AI									[5Hrs]
Ethica	I Action, A	pproaches to Ethical Reasoning by	/ AI,Desię	gning Ar	rtificial	Moral	Agents, Im	plementin	g Ethic	cal De	liberation,
The Le	evels of Eth	nical Behaviour, Ethical Status of Al	Systems	S.							
Unit I	V – Respoi	nsible AI in Practice:									[5Hrs]
Introdu	uction, Gov	ernance for Responsible AI, Codes	of Cond	uct, Inclu	usion 8	amp; l	Diversity, T	he Al Nar	rative.	Al and	l society,
Super	-intelligenc	e, Responsible AI.									
Linit V	- Casa St	udv									[5Ure]
Recon	nmendation	uuy System Medical Diagnosis educt	ion Com	puter Vi	ession	Natur		o Process	sina		
Recon	mendatio	Toystern, medical Diagnosis, educi	.011, 00111	puter vi	3331011	Ivatur	ar Languag	61100633	nig.		
Text	Books										
S.N		Title		A	uthors	;		Edition		Pu	blisher
1	Respon	sible Artificial Intelligence	Virginia	rginia Dignum			1 st	3	Springer		
2	AI Ethic	S	Mark Co		Coeckelbergh			1 st		Addisc	on-Weslev
					0				1	Profes	sional
Refer	ence Bool	ks	1				I			-	
S.N		Title			Auth	ors		Editior	١	Pu	blisher
1	Responsi	ble AI: Best Practices for Creating	D	r. Qingh	inghua Lu ,Dr./Prof.		of.	1 st		Addisc	on-Wesley
	Trustwort	hy AI Systems	Li	Liming Zhu, Prof. J			Whittle,		I	Profes	siona
			D	Dr. Xiwei Xu							

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