# SEMESTER-III

S.No	Category	Course Code	Course Title	L	Т	P	С
Theory	<i>y</i>			1			
1	BS	MA23303	Discrete Mathematics	3	1	0	4
2	PC	CL23301	Object Oriented Programming	3	0	0	3
3	PC	CL23302	Data Structures	3	0	0	3
4	PC	CL23303	Computer Architecture	3	0	0	3
5	PC	CL23304	Foundations of Artificial Intelligence	3	0	0	3
6	MC	MC23302	Human Values and Gender Equality	2	0	0	0
Theory	with Practic	cal					
7	ES	EC23306	Digital Principles and System Design	3	0	2	4
Practic	al						
8	PC	CL23305	Data Structures Laboratory	0	0	4	2
9	PC	CL23306	Object Oriented Programming Laboratory	0	0	4	2
10	EE	GE23301	Professional Development I	0	0	2	1
			TOTAL	20	01	12	25

# SEMESTER-IV

S.No	Category	Course Code	Course Title	L	T	P	С
Theory							
1	BS	MA23404	Probability and Statistics	3	1	0	4
2	PC	CL23401	Introduction to Data Science	3	0	0	3
3	PC	CL23402	Database Management System	3	0	0	3
4	PC	CL23403	Operating Systems	3	0	0	3
5	MC	MC23401	Environmental Sciences and Sustainability	2	0	0	0
Practic	al with theor	ry					- Re-
6	PC	CL23404	Computer Networks	3	0	2	4
Practic	al						
7	PC	CL23405	Database Management System Laboratory	0	0	4	2
8	PC	CL23406	Operating Systems Laboratory	0	0	4	2
9	EE	GE23401	Professional Development II	0	0	2	1
			TOTAL	17	01	12	22

Approved BOARD OF STUDIES BE CSE (AI & ML)

# SEMESTER - III

				SI	<b>EMES</b>	STE	R - II	I							
MA2	3303			DI	SCRE	ETE	MA	THE	MATI	CS			3	1	0 4
		(Common to	CSE,	CSE(	(IOT),	, CS	E(AI	&MI	L), Cy	ber, A	I&DS	, IT)			
COU	RSE OBJ	<b>ECTIVES</b>						1			1313	, paures			
To en	able the st	udents to													
1.	interpre	t the introducto	ry coi	ncepts	of Lo	ogic,	, whic	h wil	ll enab	le the	m to n	nodel a	nd a	nalyz	e the
		l phenomena in ent the definition					ılon.	from	anont:	£	1:0	•			
2.	perform	related calculat	tions.	TCICVA	ant voi	Caul	mary .	irom	quanti	mers a	and int	erence	and	be al	ole to
3.	apply th	e methodologie	es invo	olved	in solv	ving	probl	lems	related	l to fu	ndame	ntal pr	incip	les o	f sets
4.	understa	lement the math	hemat	incal id	leas fo	r rel	lation	S.							
5.		knowledge and							ha and	ita	- J-1-				
UNIT							pis or	grapi	iis and	its me	odeis.				
		PROPOSITIO													12
propos	sitions Tr	Logical connuth tables; Tau	itologi	ies, C	ompoi	una trodi	proj	positi	ons,	Condi	tional	and	bi-co	ondit	ional
implic	ations – D	e Morgan's La	ws. N	Iormal	l forms	u au	rincin	s; co	ntrapo	sitive	; Logi	cal equ	iivale	nces	and
Rules	of inferen	ce; Arguments -	- Valid	dity of	f argur	ment	ts.	ai coi	ijuncti	ve and	u disju	nctive	norm	iai ic	rms;
UNIT		PREDICATE													12
Predic	ates - State	ement function,	Varia	bles, l	Free ar	nd b	ound	varial	bles; C	uantii	fiers: I	Inivers	e of c	lisco	urca
Logica	il equivale	ences and impli	ication	ns for	quant	tifie	d state	emen	ts: Th	eory (	of infe	rence -	The	rule	es of
univer	sal specifi	cation and gene	raliza	tion; \	Validit	ty of	fargu	ments	5.						
UNIT	III	SET THEORY	Y												12
Basic o	concepts -	Notations, Subs	set, A	lgebra	a of set	ts, th	ie pov	ver se	et: Ord	ered r	airs at	nd Cart	ecian	pro	luot:
Kelatic	ons on sets	s - Types of rela	ations	and t	their pi	rope	erties,	Rela	tional	matrix	and t	he oran	sh of	rela	tion:
Partitio	ons; Equiv	alence relations	s. Part	ial ord	dering	- Po	sets,	Lattic	es as	Posets	, Prop	erties o	f latt	ices.	,
UNIT	IV	FUNCTIONS													12
Definit	tions of fu	unctions, Classi	ificati	on of	funct	ions	, Typ	e of	functi	ons, l	Examp	les. Co	mno	sitio	n of
unctio	ons, Invers	se functions; Bi	inary	and n	n-ary c	opera	ations	; Cha	aracte	istic	function	n of a	set;	Has	hing
unctio	ns; Recurs	sive functions; I	Permu	ıtation	ı functi	ions	i.								
JNIT	V	GRAPHS													12
Graphs	and grap	h models; Grap	ph ter	minol	logy ar	nd s	specia	1 type	es of	graphs	; Mati	rix repi	resen	tatio	n of
graphs	and graph	isomorphism;	Conne	ectivit	y - Eul	ler a	and Ha	amilto	on pati	hs.		•			
	na/	2317(4)176	191.31								тот	AL PE	ERIC	DS	60
COUR	SE OUT	COMES		1											
At the	end of this	course, student	ts will	l be ab	ole to							BT M	apne	d	
701 [		Troson		4							(	Highes			
CO1		positional logic											pply		K3)
CO2	apply the	rules of infer	rence	and r	method	ds o	of pro	of in	pred	icate			pply		
CO3	explain th	to verify the val	fuc:	of argi	uments	S.						A	hhià	mg (	(67
CO4		ne knowledge of						1172				A	pply	ing (	K3)
204	relations.	ize different ty	ypes	of fu	nction	is a	nd so	olve	recurr	ence		Unders	stand	ing (	K2)
	. Cidtions.														

CO5	apply the concepts of discrete structures such as Euler and Hamilton paths.	Applying (K3)
	paths.	

- 1. Trembly, J.P. and Manohar, R., "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw-Hill, 35th Reprint, 2008.
- 2. Veerarajan T., "Discrete Mathematics with Graph Theory and Combinatorics", Reprint Edition, Tata McGraw Hill Publishing Company, New Delhi, 2013.

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- 1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 8th Edition, Tata McGraw Hill Education Private Limited, New Delhi, 2012.
- 2. Tamilarasi, A., and Natarajan, A. M., "Discrete Mathematics and its Applications", 3rd Edition, Khanna Publishers, 2008.
- 3. Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
- 4. Ralph.P.Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", 4<sup>th</sup> Edition, Pearson Education, 2002.

# **CO-PO MAPPING:**

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)

	T					P	O's						PS	O's
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	3	-	-	-	-	-	-	-	3	2	2
CO2	3	2	3	3	-	-	-	-	-	-	-	3	2	2
CO3	2	3	3	2	-	-	-	-	-	-	-	2	2	2
CO4	2	2	2	3	-	-	-	-	-	-	-	2	2	2
CO5	3	3	3	3	-	-	-	-	-	-	-	3	2	2



CL23	301		DJECT OKI	ENTED PRO	GICAMMI	NG.	3	0	$0 \mid 3$
COU	RSE OBJEC	TIVES					Y	YAVA	
To en	able the stude	nts to	211		The State .		14		
1.	understand	OOP concepts	and basics of J	ava programn	ning languag	ge.			
2.	know the p	rinciples of inh	eritance, packa	ges, and interf	faces.				
3.	develop a j	ava application	with threads as	nd generics cla	asses.				
4.	define exce	eptions and use	I/O streams.	y w	70		7111		
5.	understand	Graphical User	Interface App	lication using	JavaFX.				
UNIT	'I IN	TRODUCTIO	N TO OOP AN	ND JAVA					9
Progra Contro	amming – Java ol Statements - ess specifiers -	- Object or a Buzzwords - - Programming Static member HERITANCE,	Overview of Ja Structures in Ja s- Java Doc con	iva – Data Typ ava – Defining mments.	oes, Variable classes in J	es and Arra	ys - O	perat	ors
Dispat Memb	tch –Abstract	- Types of Inh Classes – final	with Inheritanc	e. Packages ar	nd Interface	s: Packages	s – Pacl	kages	and
Except	III EX tion Handling	porting Packag CEPTION HA basics – Multip	es – Interfaces  NDLING AN  le catch Clause	.  D MULTITH s - Nested try	Statements -	– Java's Bu	ilt-in E	xcept	ion
Except  - User  Multip  and Ste	tion Handling r defined Exc ple Threads – F opping Thread	Poorting Package CEPTION HAD basics — Multipe eption. Multithe Priorities — Syncols — Multithread	es – Interfaces.  NDLING AN  le catch Clause readed Program  chronization – I  ing. Wrappers	D MULTITH s – Nested try mming: Java Inter Thread C – Auto boxing	Statements - Thread Moo	– Java's Bu del–Creatin	ng a Th	read	and
Except  - User  Multip	tion Handling r defined Exc ple Threads – F opping Thread	CEPTION HA basics – Multip eption. Multith	es – Interfaces.  NDLING AN  le catch Clause readed Program  chronization – I  ing. Wrappers	D MULTITH s – Nested try mming: Java Inter Thread C – Auto boxing	Statements - Thread Moo	– Java's Bu del–Creatin	ng a Th	read	ion and ing
Except  - User  Multip  and Ste  UNIT  I/O Ba  Generi	tion Handling r defined Exc ple Threads – F copping Thread IV I/O asics – Readir ic Programmi	ception Package CEPTION HA basics – Multipeption. Multither of Syncols – Multithread, GENERICS, and Writing and Writing of Generic of Central Control of Central Cont	es – Interfaces.  NDLING AN  le catch Clause readed Program chronization – I ing. Wrappers  STRING HAN  Console I/O – classes – Gene	D MULTITH s – Nested try mming: Java Inter Thread C – Auto boxing NDLING - Reading and eric Methods	Statements - Thread Mo ommunicati s.  Writing Fi - Bounded	– Java's Bu del–Creatin on Suspend	ng a Th ding –R	esum Gene	ion and ing
Except  - User  Multip  and Ste  UNIT  I/O Ba  Generi	tion Handling r defined Exc ple Threads – F opping Thread IV I/O asics – Readir ic Programminations. Strings:	ception Package CEPTION HA basics – Multipeption. Multitheriorities – Syncols – Multithread, GENERICS, ag and Writing	es – Interfaces.  NDLING AN  le catch Clause readed Program chronization – I ing. Wrappers  STRING HAN  Console I/O – classes – General ass, methods an	D MULTITH s – Nested try mming: Java Inter Thread C – Auto boxing NDLING - Reading and eric Methods and String Buff	Statements Thread Moo ommunicati	- Java's Budel-Creating on Suspender less Street Types - 1	ng a Th ding –R ams – G	esum Gene	ion and ing
Except  - User Multip and Ste UNIT  I/O Ba Generi Limita UNIT  JavaF  Toggle Layout	tion Handling r defined Exc ple Threads – F opping Thread IV I/O asics – Readir ic Programminations. Strings: V JAV X Events and Button – Rad	basics – Multipeption. Multipeption. Multitheriorities – Syncolorities – Generic of Basic String of VAFX EVENT Controls: Eventio Buttons – Lie – HBox and	es – Interfaces.  NDLING AN  le catch Clause readed Program chronization – I ing. Wrappers  STRING HAN  Console I/O – classes – General ass, methods an  HANDLING,  t Basics – Har st View – Com	D MULTITH s – Nested try mming: Java Inter Thread C – Auto boxing NDLING - Reading and eric Methods and String Buff CONTROLS adding Key an abo Box – Cho	Statements Thread Moo ommunicati  Writing Fi — Bounded For Class. S AND CO  d Mouse E- pice Box — T	- Java's Bu del-Creatin on Suspend les Stree Types - I	ams – GRestrict  TS  trols: C  ls – Scr	Gene tions Theck roll P	ions and ing
Except  — User  Multip and Str  UNIT  I/O Ba  Generi Limita  UNIT  JavaF  Toggle Layout Menu	tion Handling r defined Exc ple Threads – I opping Thread IV I/O asics – Readir ic Programminations. Strings: V JAV X Events and Button – Rac ts – Flow Pan – Menu bars –	basics – Multipeption. Multitheriorities – Syncols – Multithread GENERICS, ag and Writing and Writing – Generic of Basic String clay AFX EVENT Controls: Even lio Buttons – Lie – HBox and Menu Item.	es – Interfaces.  NDLING AN  le catch Clause readed Program chronization – I ing. Wrappers  STRING HAN  Console I/O – classes – General ass, methods an  HANDLING,  t Basics – Har st View – Com	D MULTITH s – Nested try mming: Java Inter Thread C – Auto boxing NDLING - Reading and eric Methods and String Buff CONTROLS adding Key an abo Box – Cho	Statements Thread Moo ommunicati  Writing Fi — Bounded For Class. S AND CO  d Mouse E- pice Box — T	- Java's Bu del-Creatin on Suspend les Stree Types - 1  MPONEN vents. Contro	ams – GRestrict  TS  trols: C  ls – Scr	Gene tions Theck roll P	ions and ing
Except  - User Multip and Ste UNIT  I/O Ba Generi Limita UNIT  JavaF  Toggle Layout Menu  COUR	tion Handling r defined Exc ple Threads – F copping Thread IV I/O asics – Readir ic Programmitations. Strings: V JAV X Events and Button – Rac ts – Flow Pan – Menu bars –	basics – Multipeption. Multitheriorities – Syncols – Multitherad, GENERICS, and Writing and Writing – Generic of Basic String clay AFX EVENT Controls: Even Lio Buttons – Lio Menu Item.	es – Interfaces.  NDLING AN  le catch Clause readed Program chronization – I ing. Wrappers  STRING HAN  Console I/O – classes – General ass, methods an  HANDLING,  t Basics – Har st View – Com  VBox – Border	D MULTITH s – Nested try mming: Java Inter Thread C – Auto boxing NDLING - Reading and eric Methods and String Buff CONTROLS adding Key an abo Box – Cho	Statements Thread Moo ommunicati  Writing Fi — Bounded For Class. S AND CO  d Mouse E- pice Box — T	Java's Budel–Creating on Suspender S	ams – CRestrict  TS  trols: C ls – Screen Service  PERIC	Genetions Theck roll P Basi	ion and ing
Except  - User Multip and Ste UNIT  I/O Ba Generi Limita UNIT  JavaF) Togglet Layout Menu  COUR	tion Handling r defined Exc ple Threads – F copping Thread IV I/O asics – Readir ic Programmitations. Strings: V JAV X Events and Button – Rac ts – Flow Pan – Menu bars –	basics – Multipeption. Multitheriorities – Syncols – Multithread GENERICS, ag and Writing and Writing – Generic of Basic String clay AFX EVENT Controls: Even lio Buttons – Lie – HBox and Menu Item.	es – Interfaces.  NDLING AN  le catch Clause readed Program chronization – I ing. Wrappers  STRING HAN  Console I/O – classes – General ass, methods an  HANDLING,  t Basics – Har st View – Com  VBox – Border	D MULTITH s – Nested try mming: Java Inter Thread C – Auto boxing NDLING - Reading and eric Methods and String Buff CONTROLS adding Key an abo Box – Cho	Statements Thread Moo ommunicati  Writing Fi — Bounded For Class. S AND CO  d Mouse E- pice Box — T	Java's Bu del-Creatin on Suspend des. – Stree Types – I MPONEN vents. Contro id Pane. M TOTAL BT	ams – Grols: Crols: Cro	Genetions Theck roll P Basi	ion and ing
Except  — User Multip and Ste UNIT  I/O Ba Generi Limita UNIT  JavaF  Toggle Layout Menu  COUR  At the	tion Handling r defined Exc ple Threads – F copping Thread IV I/O asics – Readir ic Programmitations. Strings: V JAV X Events and Button – Rac ts – Flow Pan – Menu bars –  RSE OUTCOM end of this con	basics – Multipeption. Multitheriorities – Syncols – Multitherad, GENERICS, and Writing and Writing – Generic of Basic String clay AFX EVENT Controls: Even Lio Buttons – Lio Menu Item.	es – Interfaces.  NDLING AN  le catch Clause readed Program chronization – I ing. Wrappers  STRING HAN  Console I/O – classes – Gene ass, methods an  HANDLING,  t Basics – Har st View – Com  VBox – Border	D MULTITH s – Nested try mming: Java Inter Thread C – Auto boxing NDLING - Reading and eric Methods and String Buff CONTROLS adding Key an abo Box – Cho	Statements Thread Moo ommunicati  Writing Fi — Bounded For Class. S AND CO  d Mouse E- pice Box — T	Java's Budel–Creating on Suspender S	ams – CRestrict  TS  trols: C ls – Screen Service  PERIC	Genetions Theckroll P Basi  DDS	ion and ing
Except  — User Multip and Str UNIT  I/O Ba Generi Limita UNIT  JavaF  Toggle Layout Menu  COUR  At the	tion Handling r defined Exc ple Threads – Fopping Thread IV I/O asics – Readir ic Programminations. Strings: V JAV X Events and Button – Rac ts – Flow Pan – Menu bars –  RSE OUTCOM end of this con explain the be	basics – Multipeption. Multitheriorities – Syncols – Multitherad, GENERICS, ag and Writing of Generic of Basic String clay AFX EVENT Controls: Even Lio Buttons – Lio Menu Item.  MES  urse, students was and controls.	es – Interfaces.  NDLING AN  le catch Clause readed Program chronization – I ing. Wrappers  STRING HAN  Console I/O – classes – Gene ass, methods an  HANDLING,  t Basics – Har st View – Com VBox – Border  rill be able to	D MULTITH s – Nested try mming: Java Inter Thread C – Auto boxing NDLING - Reading and eric Methods and String Buff CONTROLS adding Key an abo Box – Cho r Pane – Stack	Statements Thread Moo ommunicati  Writing Fi — Bounded For Class. S AND CO  d Mouse E- pice Box — To c Pane — Gr	Java's Budel–Creating on Suspender S	ams – Restrict  TS  trols: Ctrols: Ctr	Genetions Theck roll P Basi  DDS  ed vel)	ion and ing rics and oox ane cs -
Except  - User Multip and Ste UNIT  I/O Ba Generi Limita UNIT  JavaF  Toggle Layout Menu  COUR	tion Handling r defined Exc ple Threads – F copping Thread IV I/O asics – Readir ic Programmitations. Strings: V JAV X Events and Button – Rac ts – Flow Pan – Menu bars –  RSE OUTCOM end of this com explain the b demonstrate assign excep to solve real-	basics – Multipeption. Multitheriorities – Syncols – Multitheriorities – Syncols – Multithread, GENERICS, and Writing and Writing of Basic String clay AFX EVENT Controls: Evention Buttons – Lie – HBox and Menu Item.  MES  Jurse, students was a sic OOP and Jurse and	le catch Clause readed Program chronization – I ing. Wrappers - STRING HAN Console I/O – classes – General HANDLING, the Basics – Harst View – Combox – Border St View – Combox – Border Console I/O – classes – General HANDLING, the Basics – Harst View – Combox – Border C	D MULTITH s – Nested try mming: Java Inter Thread C – Auto boxing NDLING - Reading and eric Methods and String Buff CONTROLS adding Key an abo Box – Cho r Pane – Stack	Statements Thread Moo ommunicati  Writing Fi — Bounded For Class. S AND CO  d Mouse E- pice Box — To or Pane — Gr	Java's Budel–Creating on Suspender S	ams – GRestrict  TS  trols: C  ls – Screenus –  PERIC  Mapponest Le	Genetions Theck roll P Basi  DDS  ed vel) ling (	ion and ing special sp

CO5	apply the concepts of event handling, JavaFX components and	Applying (K3)
	controls for developing GUI based applications.	Applying (K3)

- 1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, New Delhi, 2019.
- 2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1st Edition, McGraw Hill Education, New Delhi, 2015.

# REFERENCES

- 1. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11th Edition, Prentice Hall, 2018.
- 2. Deitel & Deitel, "Java: How to Program", Prentice Hall of India, 2010.
- 3. Allen B. Downey and Chris Mayfield, "Think Java: How to Think Like a Computer Scientist", O'Reilly, California, First Edition, 2016.
- 4. Joshua Bloch, "Effective Java: A Programming Language Guide", Addison-Wesley Professional, US, Third Edition, 2018.

# **CO-PO MAPPING:**

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)

		-				P	O's						PS	O's
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2	2	3	2	-	-	-	-	-	-	2	2	2
CO2	2	2	3	3	2	-	-	-	-	-	-	2	2	2
CO3	3	3	2	2	2	-	-	-	-	-	-	2	2	2
CO4	3	2	2	2	2	-	-	-	-	-	-	2	2	2
CO5	2	2	3	2	2	-	-	-	-	_	-	2	2	2



CL23	302		DATA STRUCTURES	3 (	0	3
COU	RSE OBJECTI	VES				
To ena	able the students	to				
1.	understand the	e concepts of	ADTs.			
2.	learn linear da	ata structures	like lists, stacks.			
3.	apply linear d	ata structures	for queues.			
4.	apply Non-lin	ear data struc	tures for various application.			
5.	acquire differ	ent types of so	orting, searching and hashing algorithms			
UNIT	TI ABST	TRACT DAT	A TYPES (ADT)			9
Introd	uction to Data St	ructures - Def	finition, Need of Data Structures, Types of	of Data Structures;	Abst	rac
List In	nplementation, S d List - Polynom	Singly Linked ial ADT.	erations (Insertion, Deletion), Array Base List, Doubly Linked List, Circularly L	ed Implementation, inked List; Applica	, Lin	s o
1969-510 110-120						9
Impler	mentation; Appli expression.	cations of Sta	ack, Operations, Array based Imple ck - Conversion of Infix to prefix express	ementations, Linke sion, Conversion of	ed Infi	Lis x to
UNIT	III LINE	AR DATA S'	TRUCTURES – QUEUES			9
Queue Impler UNIT	nentation; Circu	lar Queue; Pri	ueue, Operations, Array based Imploority Queue; Applications of Queue.  ATA STRUCTURES – TREES, GRAP		ed	List
т						
			ologies, Binary Tree ADT, Expression th Tree ADT, AVL Trees; Graph – Def			
			t traversal, Breadth-first traversal, Topol			
UNIT	V SEAR	CHING, SO	RTING AND HASHING TECHNIQU	JES		9
Search	ning - Linear Sea	rch, Binary S	earch; Sorting - Bubble Sort, Insertion S	ort, Shell Sort, Rad	lix S	ort.
	Sort; Hashing -		ons, Separate Chaining, Open Addressi			
				TOTAL PERIO	DS	45
COUF	RSE OUTCOM	ES				
At the	end of this cours	se, students w	ill be able to	BT Mapped (Highest Lev		
CO1	understand the	different data	structures for representation.	Understandi	ng (	K2)
CO2			ctures for problem-solving using stack.	Analyzi	ng (	<b>K</b> 4)
CO3	solve the comp	utational prob	olems using queue.	Applyi	ng (	K3)
CO4	application.	rious concept	ts of trees and graphs with real time	Applyi	ng (	K3)
CO5	demonstrate t techniques.	he concept	of sorting, searching and hashing	Analyzi	ng (I	<b>~</b> 4)

- 1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2020.
- 2. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2018.

#### REFERENCES

- 1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures & Algorithms in Python", An Indian Adaptation, John Wiley & Sons Inc., 2021.
- 2. Ellis Horowitz, Sartaj Sahni and Susan Anderson Freed, "Fundamentals of Data Structures in C", 2nd Edition, Universities Press, Hyderabad, 2018.
- 3. R. Venkatesan, S. Lovelyn Rose, "Data Structures", 1st Edition, Wiley, 2019.
- 4. Seymour Lipschutz, "Data Structures with C", 4th Edition, MCGraw Hill Education, 2017.

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Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)

		.,				P	O's			· · · · · · · · · · · · · · · · · · ·		***	PS	O's
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2	2	3	3	-	-	-	-	-	1	3	3	2
CO2	3	3	3	-	3	-	-	-	-	-	1	3	3	2
CO3	3	3	3	-	3	-	-	-	-	-	1	3	3	2
CO4	3	3	3	= ==	3	-	-	-	-	-	1	3	3	2
CO5	3	3	3	-	3	-	-	-	-	-	1	3	3	2



	3303			COMPUTER ARC	CHITECTURE		3 0	0
COL	JRSE OB	<b>JECTIVES</b>						
Тое	nable the	students to						
1.	learn	basics structure	and op	erations of computer.				
2.	study	the operations	of arithr	netic and logic unit				
3.	acqui	re knowledge a	bout pip	elining and parallel p	rocessing			
4.				tual and cache memo				
5.				ommunicating with I		O interfaces.		_
UNI				E OF COMPUTE				T
Adar	oprocesso	rs and Microco	ations; ntrollers	Concepts; Bus Struction and 1 - 8085 Microprocess  D LOGIC UNIT	nstruction Sea	uencing: Inti	roduction	n f
				nbers; Design of Fas				!
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Proce Secon UNIT Acces multip	ssors; Pendary stora V ssing I/O ole device	rformance Con age devices.  I/O ORGANI devices; Interruss, Controlling and I/O Interface	IZATIO  upts - Ir Device	xample of Mapping ons; Virtual memo  N terrupt Hardware, E Request, Exceptions	Techniques, Exaries; Memory r	mple of Cache nanagement r	e Comme requirem pts, hand ses; Inter	pping ercia ents
Proce Proce Secon UNIT Acces multip circuit	ssors; Pedary stora V ssing I/O ble device ts; Standa	rformance Conage devices.  I/O ORGANI devices; Interrues, Controlling rd I/O Interface	IZATIO  upts - Ir Device s (PCI, S	xample of Mapping ons; Virtual memo  N  terrupt Hardware, E Request, Exceptions  SCSI, and USB).	Techniques, Exaries; Memory r	mple of Cache nanagement r  abling Interrupy Access; Bus	e Comme requirem pts, hand ses; Inter	pping ercia ents dling
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- Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Fifth Edition, Tata McGrawHill, 2015.
- 2. David A. Petterson and John L. Hennessey, "Computer organization and design", Morgan Kauffman / Elsevier, Fifth edition, 2014.

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# **CO-PO MAPPING:**

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)

		-				P	O's						PS	O's
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	2	1	-	-	-	-	1	-	-	3	1
CO2	3	2	1	2	-	-	-	-	-	-	-	-	2	1
CO3	3	2	1	2	1	-	-	-	-	-	-	-	1	1
CO4	3	2	2	1	-	-	-	-	-	-	-	-	1	1
CO5	2	2	1	1	-	-	-	-	-	-	-	-	2	1



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To ena	ble the stu	dents to			7.3			li all									
1.	understa	nd the	various ch	hara	acter	ristics	of Inte	tellige	nt ag	ents.							
2.	learn the	e differe	nt search	n eng	gine	es in A	AI.										
3.	The second secon		esent knov														
4.			lifferent v					softwa	are ag	ents	3.						
5.	know ab	out the	various a	appli	licati	ions o	of AI.			167			13oH				
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UNIT	II In Solving 1		EM SOL														
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CO4	demonstrate software agents to solve a problem.	Applying (K3)
CO5	make use of some of the AI applications for solving real-time applications.	Applying (K3)

- 1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", 4th Edition, Pearson Education, 2022. ISBN-13: 978-9356063570.
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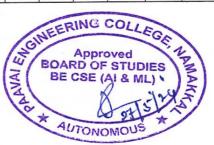
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7			,,	, , ,		P	O's						PS	O's
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2	1	2	ĺ	1	-	1	-	-	-	1	2	1
CO2	2	2	3	2	2	1	-	1	-	-	-	1	2	2
CO3	2	2	2	2	3	1	-	1	-	-	-	1	2	2
CO4	2	3	2	2	1	1	-	1	-	-	-	1	3	1
CO5	2	3	3	2	1	1	-	1	-	-	-	1	2	1



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2.	to n	avigate mo	s of persona dern challe	enges e	ffective	ely.								
3.			e of values											
4.	emp	owerment	cio-econor and advoca	acy.										
5.	critic viole	cally analys	se prevaler mination,	nt issue and cul	es and tural bi	challer iases, a	nges fa	iced b pose i	y won neasur	nen, inclues for the	iding g	gen icat	der- tion.	bas
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and belimproved  UNIT I  Profess Civic set Corporate of Relig  UNIT I  Gender Educati Parental Male Cl  UNIT V  Women related	al Deversal	elopment - owards Ger owards Ger Comparis Physical e VALUE DEVELO alues Int d Responsi al Responsi al Responsi alues - Spir GENDE ty - Defin althcare, Paregiving R sm; Sustair WOMEN and Challe and Challe and deaths,	Introspect Inder Equal Ison and Concerning Introspect Ison and Concerning Introspect Interpolation I	ion, Se ity; Re ompeting Meditati TION To sponsible bal Value sthetic mought pure powerm epresentities; Le lopment AND (male fe violence of the strong stron	elf-confiliability tion, Po fon, Yo fowar  folity, P ues - C values; process ment, E ntation, egal an nt.  CHAL  ticide,	fidence y; Unity Positive oga.  RDS N  Punctua Compute ; Nation s.  Econom Gend ad Police violence	NATIO  ality, D  er Ethi  nal Inter  er-base  cy Reform  ESS  ce again	Negation Converse of the conve	AND tion - Foral Leon and Condolence Cultural	ges of Actudes; Factudes; Factudes; Factudes; Factudes; Factudes; Factudes; Facture adership, Internation of Challen Shifts; Components	L  Code  conal un  Code  Code	cont of of one of of one of of one of	Emcconpete	enc duc ducindir diving the control of the control

COUR	SE OUTCOMES	
At the	end of this course, students will be able to	BT Mapped
		(Highest Level)
CO1	discuss the concept of human values and their significance in personal and societal development.	Understanding (K2)
CO2	demonstrate introspective skills to enhance personal growth and self-awareness.	Applying (K3)
CO3	recognize the importance of gender equality in promoting a just and equitable society.	Understanding (K2)
CO4	cultivate a sense of social responsibility and ethical conduct towards achieving national and global development.	Analyzing (K4)
CO5	analyse the challenges faced by women in various spheres and identify strategies for addressing them.	Analyzing (K4)
TEXT	BOOKS	
1.	A Foundation Course in Human Values and Professional Ethics Approach to Value Education - Through Self-exploration. New Delhi	
2.	Aurther, John. Personality Development. Lotus Press, 2018.	

# REFERENCES

- 1. Joshi, Dhananjay. Value Education in Global Perspective. Lotus Press, 2014.
- 2. Mahrotra, Mamta. Gender Inequality in India: Challenging Social Norms. Prabhat Books, 2015.

# **CO-PO MAPPING:**

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)

						P	O's	, ,					PS	O's
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	1	-	1	1	1	2	3	2	1	1	3	2	2
CO2	-	1	-	1	1	1	3	3	2	2	1	1	2	2
CO3	-	1	-	1	1	1	2	3	1	1	1	3	2	2
CO4	-	1	-	1	1	1	2	3	2	2	1	2	2	2
CO5	-	1	-	1	1	1	1	3	2	2	1	3	2	2



EC23.	306	DIGITAL PRINCIPLES AND SYSTEM DESIGN	3	0	2	4
		Common to CSE, IT, CSE(AIML) and CSE(AIDS)				
COUI	RSE OB	TECTIVES				
To ena	able the s	tudents to				
1.	underst	and the fundamentals of Boolean algebra and digital logic gates.				
2.	know t	ne concepts of various combinational circuits.				
3.	gain kn	owledge about different synchronous sequential circuits.				
4.	be fam	liar with the operation of asynchronous sequential circuits.			ħů.	
5.	acquire	basic knowledge about Memory and Programmable Logic Devices.	4 1			
UNIT	I	BOOLEAN ALGEBRA AND LOGIC GATES	7 146		9	
Boolea	an laws a	nd Theorem, Boolean functions - Canonical and Standard forms - Sum of I	Produ	cts,	Produc	t of
Sums;	Simplifi	cations of Boolean functions - Karnaugh map, Quine McCluskey method, De	on't c	are C	onditi	ons;
Implei	mentation	s of Boolean Functions using logic gates, NAND, NOR.				
UNIT	II	COMBINATIONAL CIRCUITS			9	
Design	n procedi	re of Combinational circuits - Adders, Subtractors, 4-bit Parallel adder / Su	ubtrac	tor, (	Carry	ook
ahead	adder, E	CD adder, Multiplexer, Demultiplexer, Encoder, Decoder, 2-bit Magnitud	e Coi	npara	tor; C	ode
conve	rters, Par	ty generator and checker.				
UNIT	III	SEQUENTIAL CIRCUITS			9	
Latche	es, Flip f	ops - SR, JK, D, T Flip-flops, Realization of flip flop using other flip flo	ps; C	lassif	icatio	ı of
sequer	ntial circ	uits - Asynchronous and Synchronous counters; Moore and Mealy; Des	ign c	f Syı	nchron	ous
counte	ers - Mod	ulo - N counter; Shift registers - SISO, SIPO, PISO, PIPO.				
UNIT	IV	ASYNCHRONOUS SEQUENTIAL CIRCUITS	Car 14		9	
Design	n of fund	amental mode and pulse mode circuits - Primitive flow table, Minimization	on of	Prim	itive f	low
table,	State ass	ignment, Excitation table; Cycles - Race Free State assignment; Hazards	s - S1	atic,	Dynaı	nic,
Essent	ial Hazaı	ds, Elimination of Hazards.				
UNIT	V	MEMORY AND PROGRAMMABLE LOGIC DEVICES			9	
Classit	fication of	f memories - ROM organization, types; RAM organization, types - Static I	RAM	Cell,	Dyna	mic
	cell: Mer					
RAM	0011, 11101	nory Expansion; Programmable Logic Devices - PLA, PAL, Basics of FPGA				
		nory Expansion; Programmable Logic Devices - PLA, PAL, Basics of FPGA ERIMENTS				
LIST	OF EXP					
LIST	OF EXP	ERIMENTS		using	, logic	
1. De 2. De	OF EXP	ERIMENTS implementation of Adders and Subtractors using logic gates.		using	g logic	

- 4. Design and implementation of Encoder and decoder.
- 5. Design and implementation of 4-bit Ripple counter / 3-bit synchronous Up/Down counter.
- 6. Implementation of 4-bit shift registers using Flip flops. (SISO/ SIPO/PISO/PIPO).

		TOTAL PERIODS	75
COUL	RSE OUTCOMES	ВТ	MAPPED
At the	end of this course, the students will be able to	(Hi	ghest Level)
CO1	apply Boolean functions in digital design.	Apply	ing (K3)
CO2	design and implement combinational circuits.	Apply	ing (K3)
CO3	design and implement synchronous sequential circuits.	Apply	ing (K3)
CO4	analyze the types of asynchronous sequential circuits.	Analy	zing (K4)
CO5	classify memory devices and PLDs.	Under	standing (K2)

- 1. M. Morris Mano and Michael D. Ciletti, 'Digital Design', Pearson, 6<sup>th</sup> Edition, 2018.
- 2. H. Charles Roth Jr, "Digital System Design using VHDL", Thomson / Brooks cole, 2015.

# REFERENCES

- 1. S. Salivahanan and S. Arivazhagan, "Digital Circuits and Design", 4<sup>th</sup> Edition, Vikas Publishing House Pvt.Ltd, New Delhi, 2012.
- 2. John .M Yarbrough, "Digital Logic Applications and Design", Thomson Publications, New Delhi, 2007.
- 3. Charles H.Roth, "Fundamentals of Logic Design", 6th Edition, Thomson Publication Company, 2010.
- 4. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 5<sup>th</sup> edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.

# CO-PO MAPPING:

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong, 2 – Medium, 1 – Weak

						P	O's						PS	O's
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	-	1	-	-	-	1	1	-	2	2	2
CO2	3	2	2	-	1	-	-	-	1	1	-	2	2	2
CO3	3	2	2	-	1	-	-	-	1	1	-	2	2	2
CO4	3	2	2	-	1	-	-	-	1	1	-	2	2	2
CO5	3	1	2	-	1	-	-	-	1	1	-	2	2	2



CL23	305			DAT	A STR	UCTU	RES L	ABOR	RATOF	RY	0)	0	0	4	2
COUI	RSE O	BJEC'	TIVES												
To ena	able the	stude	nts to												
1.	imple	ement l	oasic da	ta struc	ture us	ing an	array.								
2.	imple	ement l	inear da	ata stru	ctures.										
3.	apply	variou	is opera	itions o	n non-l	inear d	ata stru	ctures.							
4.	get fa	miliar	ized to	sorting	and sea	rching	algorit	hms.							
LIST			MENT											,	
1.	Array	y imple	mentati	ion of I	List AD	T.									
2.	Link	ed List	Implen	nentatio	n of Si	ngly an	d Doub	oly Linl	ked Lis	t.					
3.	Array	Imple	mentat	ion of S	Stack A	DTs.									
4.	Imple	ementa	tion of	Evaluat	ing Pos	stfix Ex	pressio	ns, Infi	ix to Po	stfix co	onversio	on.			
5.	Array	Imple	mentati	ion of (	Queue A	ADTs.									
6.	Appl	ication	s of Qu	eue AD	Ts.								•		
7.	Imple	ementa	tion of	Binary	Search	Trees.							-		
8.	Imple	ementa	tion of	AVL T	rees.										$\neg$
9.	Imple	ementa	tion of	Graph 7	Travers	al algo	rithms.								
10	. Imple	ementa	tion of	Linear	Search	and Bir	nary Se	arch.							
11	. Imple	menta	tion of l	Insertio	n Sort	and Bu	bble So	rt.							
12	. Imple	menta	tion of l	Hashing	g. (Any	one co	llision	techniq	ue).						
											ТОТА	L PEF	RIODS	60	
COUR	RSE O	UTCO	MES											1.0	
			urse, sti	udents	will be	able to						BT M	apped		$\dashv$
													t Leve	l)	
CO1			sic data			_	•						ng (K3)		
CO2			ous ope										ng (K3)		
CO4			ing and						ires.				ng (K3) ng (K3)		-
CO-PC							0					трріўп	18 (113)		-
Mapp	oing of	Cours	e Outc	ome (C	O's) w	ith Pro	gramn	ne Out	comes	(PO's)	and Pr	rogran	ıme Sr	ecifi	c
						Outco	mes (P	SO's)					_		
		).(	(1/2/3 i	ndicate	s stren			tion) 3	-Stron	g, 2-Me	edium,	1-Wea	T		_
CO's	1	2	3	4	5	6 6	O's 7	8	9	10	11	12		SO's	_
CO1	3	3	3	-	3	-	-	-	2	10	11	12	1	2	_
CO2	3	3	3	_	3	_	_		2	_	1	3	3	1	
CO3	3	3	3	-	3	-	-	-	2	-	1	3	3	1	_
CO4	3	3	3			CC		-	2	_	1	3	3	1	
				100	RING	COLL	En	_	2		1	د ا	3	1	

Approved BOARD OF STUDIES BE CSE (AI & ML)

AUTONOMOUS

CL23	306	(	OBJEC	T OR	IENTE	D PRC	GRAI	MMIN	G LAB	ORAT	ORY	0	0	4	2
COU	RSE O	BJEC	<b>TIVES</b>												
To en	able the	e stude	nts to												
1.	build	softwa	are deve	elopme	nt skills	using	java pr	ogramn	ning for	r real-w	orld ap	plicati	ons.		
2.	unde	rstand a	and app	ly the	concept	s of cla	sses, pa	ackages	s, and in	nterface	es.				
3.	imple	ement e	exception	on hand	lling an	d perfo	rm file	process	sing.						
4.	deve	lop app	lication	ns using	g generi	c progr	ammin	g and e	vent ha	ndling.					
LIST	OF EX	PERI	MENT	S											
1.						al sear	ch, bina	ary sear	ch, and	quadra	atic sort	ing			
2.			selection			ictures	using	classes	and ohi	oots					
3.								pt of pa							
4.					ising an			pt of pa	ckage.						
5.								ıser def	ined ev	cention	1C				
6.								hread a							
7.					n file o			in cad a	ppricati						
8.								s and k	ev ever	ite ilein	a Adam	ter clas	CCAC		
9.								s of ger			g Auap	ter cras	sses.		
1000								youts ar							
11	mana	ge all a	a appin ispects	of stud	or Stuu ent info	rmation	n such	on Syste as stude	em. It is	usea to	o store,	admin	ister a	and	4
	detail	s, grad	es of st	udents,	etc.	imatio	ii sucii i	as stude	oni ucia	ns, suo	jecis, se	emeste	rs, en	rolln	nent
12	. Write	a Java	progra	m that	works a	as a sim	ple cal	culator	. Use a	grid lay	yout to	arrang	e butt	ons	for
	digits	and fo	r the +	-*/%	operati	ons. A	dd a tex	kt field	to displ	ay the	result.	0			
											ТОТА	L PEI	RIOD	S	60
COU	RSE O	UTCO	MES												
At the	end of	this co	urse, st	udents	will be	able to						BT M	appe	d	
												Highes			
CO1								rld app			Α	nalyzi	ng (K	(4)	
COZ	classe	igate d	ages, a	metho	dologie rfaces	s to cre	eate app	olication	n using		Α	nalyzi	ng (K	(4)	
CO3						rform f	ile pro	cessing			Δ	nalyzi	ng (K	1)	
CO4								& event		ng.		Applyii			
CO-P	O MAI											11 7	0 (	,	
Mapp	oing of	Cours	e Outc	ome (C	O's) w	ith Pro	gramn	ne Out	comes	(PO's)	and Pr	ogran	nme S	Spec	ific
	Jutcon	ies (PS	O's) (1	/2/3 in	dicates			orrelat	ion) 3-	Strong	, 2-Med	lium,	1-We	ak	
CO's	1	2	2		_		D's	-					I	PSO	S
a tarves and	1	2	3	4	5	6	7	8	9	10	11	12	1		2
CO1	3	2	2	1	2	-	-	1	1-	-	-	1	2		2
CO2	3	2	1	2	2	-	-	1	-	-	-	1	2		2
CO3	3	3	2	THE STATE OF THE S			LEGE,	1	-	-	-	1	2		3
CO4	3	1	1	S OF THE S	2 <sub>Ap</sub>	proved	JDIES.	包	-	-	-	1	3		2
				AK ( °	BE CS			美							

AUTONOMOUS

	301		PROFESSIONAL DEVELOPMENT	I 0	0 2	2   1
COU	RSE OB	<b>JECTIVES</b>				
To ena	able the	students to				
1.	enhar		the student's professional skills and introduc	ce the function of	corpo	orate
2.	enha	nce and develop th	ne students behavioral, speaking and listening	g skills to face the	interv	iew
3.	solve	advance level ve	rbal aptitude tests to get placed in Tier I com	npanies.		
4.	impro	ove their reasonin	g skills to get placed in reputed companies.			
UNIT	I	SELF – UNDE SKILLS	ERSTANDING AND PERSONALITY EN	HANCEMENT		7
Introd	uction s	elf-exploration;	SWOT analysis - Types and barriers; Et	ffective commun	icatio	n ii
workp	lace; Lea	adership skills; D	ecision making - Problem solving; Goal sett	ting – Critical, str	ategic	and
lateral	thinking	;; JAM level- I; B	asic resume building level- I.			
UNIT	II	BEHAVIOUR	AL SKILLS, LISTENING AND SPEAKI	NG SKILLS		7
Rehav	ioural sk	ills: Time manage	ement; Emotional intelligence; Analytical thi	inking Listoning	Listo	nina
UNIT		GD Level-1.  QUANTITAT	IVE APTITUDE			
			F; Simple interest and compound interest; A	verage; Pipes and	d ciste	
Area;	Profit an	d loss.		verage; Pipes and	d ciste	erns
Area; I	Profit an IV	d loss.  LOGICAL RE	CASONING		d ciste	erns
Area; I	Profit an IV	d loss.  LOGICAL RE			d ciste	
Area; I	Profit an  IV  al sequen	d loss.  LOGICAL RE	CASONING			erns
Area; I UNIT Logica COUF	Profit an  IV  al sequen	d loss.  LOGICAL RE  ce; Analogy; Cla  TCOMES	EASONING ssification; Causes and effect; Making judgn	ment; Directions.		erns:
Area; Dunit Logica  COUF	Profit an  IV  al sequen  RSE OU  end of the	d loss.  LOGICAL RE  ace; Analogy; Cla  TCOMES  his course, studen	exaction; Causes and effect; Making judgments will be able to	ment; Directions.	ODS	erns:
Area; DUNIT Logical COUF At the	Profit an  IV  al sequen  RSE OU  end of the	d loss.  LOGICAL RE  ce; Analogy; Cla  TCOMES  nis course, studen  and analyze soft s	exaction; Causes and effect; Making judgments will be able to skills to improve the leadership skills.	nent; Directions.  TOTAL PERI  BT Mapp	ODS ped evel)	8
Area; DUNIT Logical COUF At the CO1 CO2	Profit an  IV  Al sequent  RSE OU  end of the define demon	d loss.  LOGICAL RE  ce; Analogy; Cla  TCOMES  nis course, studen  and analyze soft strate the behavior	ssification; Causes and effect; Making judgments will be able to skills to improve the leadership skills.	TOTAL PERI  BT Mapp (Highest L	ODS ped evel)	8 30 K(K4)
Area; I UNIT Logica COUF At the CO1 CO2 CO3	Profit an  IV  al sequen  RSE OU  end of the define demon develo	d loss.  LOGICAL RE  Ice; Analogy; Cla  TCOMES  nis course, studen  and analyze soft strate the behavior  p the problem-sol	essification; Causes and effect; Making judgments will be able to eskills to improve the leadership skills. Oral skills through various activities.	BT Mapp (Highest L	ODS  oed evel) vzing (	8 30 (K4)
COUF At the	Profit an  IV  al sequent  RSE OU  end of the define demon develo illustra	d loss.  LOGICAL RE  Ice; Analogy; Cla  TCOMES  and analyze soft service the behavior  p the problem-sol  te the logical reas	ssification; Causes and effect; Making judgments will be able to skills to improve the leadership skills.	BT Mapp (Highest L	ODS  oed evel) vzing ( ying (	3(K4) (K3)
COUF At the CO2 CO3 CO4	Profit an  IV  Al sequent  RSE OU  end of the define demon develo illustra	d loss.  LOGICAL RE  ace; Analogy; Cla  TCOMES  and analyze soft strate the behavior  p the problem-sol  te the logical reas  S	ssification; Causes and effect; Making judgments will be able to skills to improve the leadership skills. oral skills through various activities. Iving skills through quantitative aptitude. soning Skills to solve real world problems.	BT Mapp (Highest L Analy Appl	ODS  oed evel) vzing ( ying (	3(K4) (K3)
COUF At the CO2 CO3 CO4 TEXT	Profit an  IV  Al sequent  RSE OU  end of the define demon develo illustra  C BOOK  Agarw	d loss.  LOGICAL RE  ace; Analogy; Cla  TCOMES  nis course, studen  and analyze soft strate the behavior p the problem-sol te the logical reas  S  al, R.S. "Objective	ssification; Causes and effect; Making judgments will be able to skills to improve the leadership skills. Oral skills through various activities. Iving skills through quantitative aptitude. Soning Skills to solve real world problems.	BT Mapp (Highest L Analy Appl	ODS  oed evel) vzing ( ying (	8 30 (K4) (K3)
COUF At the CO2 CO3 CO4	Profit an  IV  Al sequent  RSE OU  end of the define demon develo illustra  C BOOK  Agarw	d loss.  LOGICAL RE  ace; Analogy; Cla  TCOMES  nis course, studen  and analyze soft strate the behavior p the problem-sol te the logical reas  S  al, R.S. "Objective	ssification; Causes and effect; Making judgments will be able to skills to improve the leadership skills. oral skills through various activities. Iving skills through quantitative aptitude. soning Skills to solve real world problems.	BT Mapp (Highest L Analy Appl	ODS  oed evel) vzing ( ying (	8 30 (K4) (K3)
COUF At the CO1 CO2 CO3 CO4 TEXT 1. 2.	Profit an  IV  RSE OU end of the define demon develouillustra  BOOK Agarw Agarw	d loss.  LOGICAL RE  Ice; Analogy; Cla  TCOMES  and analyze soft services the behavior  p the problem-sole the the logical reases  al, R.S. "Objective al, R.S. "Quantital and analyze soft services als and analyze soft services analyze soft services and analyze soft services and analyze soft services and analyze soft services analyze soft services and analyze soft services and analyze soft services and analyze soft serv	ssification; Causes and effect; Making judgments will be able to skills to improve the leadership skills. oral skills through various activities. lving skills through quantitative aptitude. soning Skills to solve real world problems. ore General English", S.Chand & Co.2021. ative Aptitude", S.Chand & Co.2021.	BT Mapp (Highest L Analy Appl	ODS  oed evel) vzing ( ying (	8 30 (K4) (K3)
COUF At the CO2 CO3 CO4 TEXT 1. 2. REFE	Profit an  IV  RSE OU end of the define dewelo illustra  BOOK Agarw Agarw Agarw Abhijit	d loss.  LOGICAL RE  ace; Analogy; Cla  TCOMES  and analyze soft strate the behavior  p the problem-sol  te the logical reas  al, R.S. "Objective  al, R.S. "Quantita  S  Guha, "Quantita	ssification; Causes and effect; Making judgments will be able to skills to improve the leadership skills. bral skills through various activities. lving skills through quantitative aptitude. soning Skills to solve real world problems. bree General English", S.Chand & Co.2021. ative Aptitude", S.Chand & Co.2021.	BT Mapp (Highest Land) Appl Appl	ODS  oed evel) rzing ( ying ( ying (	8 30 (K4) (K3) (K3)
COUF At the CO1 CO2 CO3 CO4 TEXT 1. 2.	Profit an  IV  Al sequent  RSE OU  end of the demon develotillustra  BOOK  Agarw  Agarw  Agarw  Agarw  Agarw  New D	d loss.  LOGICAL RE  Ice; Analogy; Cla  TCOMES  and analyze soft services the behavior  p the problem-sol  te the logical rease  al, R.S. "Objective  al, R.S. "Quantita  al, R.S." a moder  celhi.2021.	ssification; Causes and effect; Making judgments will be able to skills to improve the leadership skills. oral skills through various activities. lving skills through quantitative aptitude. soning Skills to solve real world problems. ore General English", S.Chand & Co.2021. ative Aptitude", S.Chand & Co.2021.	BT Mapp (Highest L. Analy Appl Appl Analy	ODS  oed evel) rzing ( ying ( ying (	8 30 (K4) (K3) (K3)

# CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)

			,			P	O's	***					PS	O's
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	-	-	-	-	-	3	3	2	3	-	3	1	1
CO2	-	-	-	-	-	-	2	3	2	3	-	3	1	1
CO3	3	2	2	2	-	1	-	-	-	-	2	-	2	2
CO4	2	1	3	2	-	3	3	1	-	1	2	-	2	2



# SEMESTER - IV

MA23	404		PROBABILITY	Y AND STATISTICS	S	3	1	0 4
		iotech. Cv		T), CSE(AI&ML), A				
	SE OBJECTIV		CI, CSE, CSE(IO	1), CSE(ARCHIE), A	1005,11, FO	ou, r	паг	na)
1. 1.	ble the students		ndom variables and	probability distributi	on in decigning		20000	
2.				-dimensional random		g proc		S.
3.				g, its need and applica				
٥.				g experiments, analys			1	4
4.	presenting res	earch data.	inques for designin	ig experiments, analys	mg, merprem	ig an	a	
5.	emphasize the	aspects of	control charts in qu	ality control.				
UNIT	I RANI	DOM VAR	IABLES	tiol 1				12
Discret	e and continuou	s random v	ariables – Moments	, Moment generating t	functions; Bino	mial	, Pois	sson.
Geome	tric, Uniform, E	xponential	Gamma and Norm	al distributions; Func	tions of randon	n var	iable	s.
UNIT			SIONAL RANDO					12
Joint o	listributions; N	larginal ar	d conditional dis	tributions; Covariano	e, Correlation	n an	d Li	near
regress and ide	ion; Transforma ntically distribu	ition of random	lom variables; App	lications of Central lin	nit theorem (fo	or ind	lepen	dent
UNIT			YPOTHESIS					12
Sampli				tatistical law athering	T			
mean a	nd difference of	means: Sm	all samples - Tests b	tatistical hypothesis; based on t, Chi-square	Large sample	ions	for si	ngle
varianc	e and proportion	n; Continge	ncy table (test for in	ndependent), Goodnes	ss of fit.	10113	ioi iii	can,
UNIT			PERIMENTS					12
Comple	etely randomized	d design; R	andomized block de	esign; One way and tw	vo-wav classifi	catio	ns- I	atin
square	design - 2 <sup>2</sup> facto	rial design	28/5/	,	,			
UNIT	V STAT	ISTICAL	QUALITY CONT	ROL	200==-0			12
			X and R charts) - Oling - U-test and S	Control charts for attrign test.	ibutes (P, C ar	nd NI	P cha	rts),
					TOTAL PI	ERIC	DDS	60
COUR	SE OUTCOMI	ES						
At the e	end of this cours	e, students	will be able to	-	BT M (Highes			
CO1	assign suitable	probability	distributions in eng	gineering problems.			ing (	K3)
CO2	apply the con-		screte and continu	ous two-dimensional			ing (	
CO3	apply the conc samples in real			for small and large	A	pply	ing (	K3)
CO4	analyse the prir	nciples to b	e adopted for design	ning the experiments.	· A	nalyz	ing (	K4)
CO5	examine statisti	ical data us	ing control chart in	quality control.	A	pply	ing (	K3)
TEXT	BOOKS							
1.	Milton. J. S. ar 4 <sup>th</sup> Edition, 200	nd Arnold. 7.	J.C., "Introduction	to Probability and Sta	ntistics", Tata I	McG	raw I	Hill,

2. Johnson. R.A. and Gupta. C.B., Miller and Freund, "Probability and Statistics for Engineers", Pearson Education, Asia, 7<sup>th</sup>Edition, 2007.

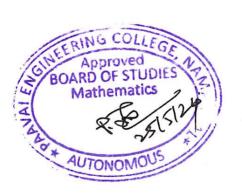
# REFERENCES

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- 2. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education Asia, 8th Edition, 2007.
- 3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3<sup>rd</sup> Edition, Elsevier, 2004.
- 4. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.

# **CO-PO MAPPING:**

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)

						P	O's						PS	O's
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	3	-	-	-	-	-	-	-	3	1	2
CO2	3	2	3	3	-	-	-	-	-	% <b>-</b>	-	3	1	2
CO3	3	3	3	2	-	-	-	-	-	-	-	2	1	2
CO4	3	3	2	2	-	-	-	-	-	-	-	2	1	2
CO5	3	3	2	3	-	-	-	-	-	-	-	2	1	2



CL234	401			INTRODUCTION TO DATA SCIEN	CE 3 0	0 3
COUR	RSE OB	JECTIVE	CS			
To ena	ble the s	students to				
1.	under	stand the f	undamen	tals of data science and its processes.		
2.	learn	and descril	be the dat	ta for the data science process.		
3.	know	the relatio	nship bet	ween data.		
4.	provid	de the Pyth	on librari	ies for Data Wrangling.		-
5.	preser	nt and inter	pret data	using visualization libraries in Python.		
UNIT	I	INTRO	DUCTIO	ON		
goals -	- Retriev	ing data -	Data pre	facets of data – Data Science Process: Ceparation – Exploratory Data analysis – – Data Mining – Data Warehousing - Ba	build the model - prese	entin
UNIT	II	DESCR	IBING D	DATA		9
Types	of Data	- Types of	Variable	es _ Describing Data with Tables and Gr	aphs – Describing Data	a witl
Averag	ges- Desc	cribing Va	riability –	- Normal Distributions and Standard (z)	Scores.	
UNIT				EL ATIONGHIDG		1 1
correla	ation – S tion coe te – inter	Scatter plo fficient — F pretation o	ts – corre Regressio of r2 – mu	RELATIONSHIPS  elation coefficient for quantitative data on – regression line – least squares regression equations – regression  ARIES FOR DATA WRANGLING	ssion line - Standard er	la fo
estimat UNIT Basics fancy operation	ation – Stion coete – inter  IV  of Number indexiring on d	Scatter plo fficient – I pretation of PYTHO Py arrays - ng – struct ata – mis	ts – corrected c	elation coefficient for quantitative data n – regression line – least squares regres ultiple regression equations – regression	ssion line – Standard er towards the mean. risons, masks, Boolean lata indexing and selec	la fo
estimat UNIT Basics fancy operation	ation – Stion coete – inter  IV  of Number indexirus on desirus on deng – pivo	Scatter plo fficient – I pretation of PYTHO Py arrays - ng – struct lata – miss ot tables.	ts – correct c	elation coefficient for quantitative data on – regression line – least squares regression litiple regression equations – regression ARIES FOR DATA WRANGLING ations – computations on arrays – companys – Data manipulation with Pandas – definition of the computation of the computat	ssion line – Standard er towards the mean. risons, masks, Boolean lata indexing and selec	la forror o
correla estimat UNIT Basics – fancy operating groupir UNIT Importi Histogr	ation – Stion coete – inter  IV  of Number of Maring on desired on desired version of the control of the contro	PYTHO Py arrays - ng - struct ata - miss ot tables.  DATA V  plotlib - L egends - c	ts – corrected corrected to the correcte	elation coefficient for quantitative data on – regression line – least squares regression equations – regression expression expressi	risons, masks, Boolean lata indexing and select datasets – aggregation density and contour p	la forror or logition - n and
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correla estimat UNIT Basics – fancy operating groupir UNIT Importi Histogr plotting	ation – Stion coete – inter  IV  of Number of	Scatter plo fficient – I pretation of PYTHO Py arrays – ng – struct lata – miss ot tables.  DATA V plotlib – I egends – of graphic Data  TCOMES	ts – corrected corrected to the correcte	elation coefficient for quantitative data in – regression line – least squares regression equations – regression equations – regression examples and examples and examples are computations on arrays – comparts – Data manipulation with Pandas – data – Hierarchical indexing – combining examples – Scatter plots – visualizing errors – subplots – text and annotation – custom assemap – Visualization with Seaborn.	risons, masks, Boolean lata indexing and select datasets – aggregation density and contour phization – three-dimensity and PERIODS	la forror o
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correla estimat UNIT Basics – fancy operating groupir UNIT Importi Histogr plotting COUR At the 6	ation – Stion coete – inter  IV  of Number of	PYTHO Py arrays - ng - struct lata - miss ot tables.  DATA V plotlib - I egends - o graphic Data  FCOMES his course, e the funda different ct relationsion technic	rests – correct Regression of r2 – mu N LIBRA aggregatured arraying data arraying data arraying data with Basel and a with Basel arraying data wit	elation coefficient for quantitative data in – regression line – least squares regression equations – regression equations – regression examples and examples and examples are computations on arrays – comparts – Data manipulation with Pandas – data – Hierarchical indexing – combining examples – Scatter plots – visualizing errors – subplots – text and annotation – custom assemap – Visualization with Seaborn.  Will be able to of data science and its processes.  data description for the data science data description for the data science.	risons, masks, Boolean lata indexing and select datasets – aggregation density and contour prization – three-dimensity and con	la forror of logical l

- 1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016.
- 2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.

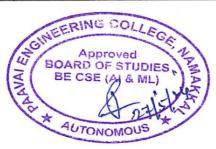
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- 2. David Taieb, "Data Analysis with Python: A Modern Approach", Packt Publishing, 2018. ISBN-978-1789950069.
- 3. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC, 2013.
- 4. Cathy O'Neil and Rachel Schutt, "Doing Data Science", O'Reilly, 2015.

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CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2	1	2	2	-	-	1	-	-	-	3	2	2
CO2	2	1	1	1	1	-	-	1	-	-	-	3	2	3
CO3	2	2	1	2	2	-	-	1	-	-	-	3	2	2
CO4	3	2	2	1	2	-	-	1	-	-	-	3	3	3
CO5	2	2	1	2	2	-	-	1	-	-	-	3	2	2



	402		DATABASE MANAGEMENT SYSTEM 3	0 0	3
COUF	RSE OB	JECTIVES			
To ena	able the s	tudents to			
1.	explo	e the fundamenta	ls of DBMS and Relational Model.		
2.	acquir	e the knowledge a	about basic, intermediate and advanced SQL.		
3.	design	the database with	n Query Languages and E-R model.		
4.	apply	the normalization	and understand the storage and File structure.		
5.	imple	ment the query pro	ocessing, optimization and Transaction.		
UNIT	I	INTRODUCTI	ON		9
Langua Manag of Rel	ages, R gement, I	elational Databas Database Architec Databases, Databa rations.	Applications, Purpose of Database Systems, View of Data, ses, Database Design, Data Storage and Querying, Tature, Database Users and Administrators; Relational Modelase Schema, Keys, Schema Diagrams, Relational Query La	ransact Struct anguag	tior ture
UNIT	II	SQL	ON TO SQL AND INTERMEDIATE AND ADVANCED		9
T	J C -1-	A	T .: ID I T		·aic
UNIT Relation	III onal Que onal Calc utes in Er	ry Languages - Tulus; E-R Model atity Sets, Entity-F	on, Functions and Procedures, Triggers.	e Dom	g air lan
Relation Attribute UNIT Relation Decome Storage Storage	onal Que onal Calcutes in Er IV onal Data position e and File of File O	ry Languages - Tulus; E-R Model atity Sets, Entity-F RELATIONAL STRUCTURE tabase Design using functional e Structure - Physicanization, Organization, Organization	con, Functions and Procedures, Triggers.  ESIGN  The Relational Algebra, The Tuple Relational Calculus, The The Entity-Relationship Model, Constraints, Removing Relationship Diagrams, Entity-Relationship Design Issues.  DATABASE DESIGN AND STORAGE AND FILE  Features of good relational designs, Functional dependencies, Normal Forms, 1NF, 2NF, 3NF, BCNF, 41 dependencies, Magnetic Disk and Flash Storage, RAID dization of Records in Files, Data-Dictionary Storage.	penden	g icy,
Relation Attributuring Relation Decome Storage	onal Que onal Calcutes in Er IV onal Data position e and File of File O	ry Languages - Tulus; E-R Model atity Sets, Entity-F RELATIONAL STRUCTURE tabase Design using functional e Structure - Physicanization, Organization, Organization	con, Functions and Procedures, Triggers.  ESIGN  The Relational Algebra, The Tuple Relational Calculus, The The Entity-Relationship Model, Constraints, Removing Relationship Diagrams, Entity-Relationship Design Issues.  DATABASE DESIGN AND STORAGE AND FILE  Features of good relational designs, Functional dependencies, Normal Forms, 1NF, 2NF, 3NF, BCNF, 41 dependencies, Normal Forms, 1NF, 2NF, 3NF, BCNF, 41 dependencies, Magnetic Disk and Flash Storage, RAID dization of Records in Files, Data-Dictionary Storage.  EESSING, QUERY OPTIMIZATION AND	penden	gain lant
Relation Attribute UNIT Relation Decome Storage Storage UNIT Query optimize Durabi	onal Que onal Calcutes in Er IV onal Dan position e and File of V Processization, Cality, Tra	ry Languages - Toulus; E-R Model atity Sets, Entity-F RELATIONAL STRUCTURE abase Design using functional estructure - Physoganization, Organ QUERY PROCUTANSACTION and Query Opost based optimizensaction Isolation	con, Functions and Procedures, Triggers.  ESIGN  The Relational Algebra, The Tuple Relational Calculus, The The Entity-Relationship Model, Constraints, Removing Relationship Diagrams, Entity-Relationship Design Issues.  DATABASE DESIGN AND STORAGE AND FILE  Features of good relational designs, Functional dependencies, Normal Forms, 1NF, 2NF, 3NF, BCNF, 41 dependencies, Normal Forms, 1NF, 2NF, 3NF, BCNF, 41 dependencies, Magnetic Disk and Flash Storage, RAID dization of Records in Files, Data-Dictionary Storage.  EESSING, QUERY OPTIMIZATION AND	penden NF, 51 , Terti	gair gair gary NF; ary
Relation Attributurilla Relation Attributurilla Relation Decome Storage Storage UNIT Query optimiz Durabi Isolation	onal Que onal Calcutes in Er IV onal Da on position e and File Or V Processi zation, Cality, Tra on levels	ry Languages - Toulus; E-R Model atity Sets, Entity-F RELATIONAL STRUCTURE abase Design using functional estructure - Physogramization, Organ QUERY PROCURANSACTION and Query Operation of the property of the	con, Functions and Procedures, Triggers.  ESIGN  The Relational Algebra, The Tuple Relational Calculus, The The Entity-Relationship Model, Constraints, Removing Relationship Diagrams, Entity-Relationship Design Issues.  DATABASE DESIGN AND STORAGE AND FILE  Features of good relational designs, Functional dependencies, Normal Forms, 1NF, 2NF, 3NF, BCNF, 41 dependencies, Normal Forms, 1NF, 2NF, 3NF, BCNF, 41 dependencies, Magnetic Disk and Flash Storage, RAID dization of Records in Files, Data-Dictionary Storage.  ESSING, QUERY OPTIMIZATION AND ONS  Detimization - Selection Operation, Sorting, Join Operation, Pation; Transaction - Transaction concept, Transaction Atom on Serializability, Transaction Isolation and Atomicity, Transaction and Atomicity, Transaction Isolation Isolati	Denden NF, 51 Heurinicity a	gair gacy NF: ary
Relation Relation Attributuring Relation Decommendation Storage Storage UNIT Query optimized Durabi Isolation COUR	onal Que onal Calcutes in Er  IV  onal Date on	ry Languages - Toulus; E-R Model atity Sets, Entity-FRELATIONAL STRUCTURE abase Design using functional estructure - Physoganization, Organ QUERY PROCURANSACTION and Query Opost based optimizansaction Isolation Implementation of COMES	ESIGN  The Relational Algebra, The Tuple Relational Calculus, The The Entity-Relationship Model, Constraints, Removing Relationship Diagrams, Entity-Relationship Design Issues.  DATABASE DESIGN AND STORAGE AND FILE  Features of good relational designs, Functional dependencies, Normal Forms, 1NF, 2NF, 3NF, BCNF, 41 dical Storage Media, Magnetic Disk and Flash Storage, RAID dization of Records in Files, Data-Dictionary Storage.  ESSING, QUERY OPTIMIZATION AND DISTRIBUTION OF TRANSACTION TRANSACTION. Transaction - Transaction concept, Transaction Atom Serializability, Transaction Isolation and Atomicity, Transaction Levels.  TOTAL PERIOD  TO	Denden NF, 51 Heurinicity a	gair lan
Relation Relation Attributuring Relation Decommendation Storage Storage UNIT Query optimized Durabi Isolation COUR	onal Que onal Calcutes in Er  IV  onal Date on	ry Languages - Toulus; E-R Model atity Sets, Entity-F RELATIONAL STRUCTURE abase Design using functional estructure - Physogramization, Organ QUERY PROCURANSACTION and Query Operation of the property of the	con, Functions and Procedures, Triggers.  ESIGN  The Relational Algebra, The Tuple Relational Calculus, The Tuple Entity-Relationship Model, Constraints, Removing Relationship Diagrams, Entity-Relationship Design Issues.  DATABASE DESIGN AND STORAGE AND FILE  Features of good relational designs, Functional dependencies, Normal Forms, 1NF, 2NF, 3NF, BCNF, 41 dependencies, Normal F	DDS	gair gacy NF: ary
Relation Attributuring Relation Attributuring Relation Decommendation Storage Storage UNIT Query optimized Durabi Isolation COUR	onal Que onal Calcutes in Er  IV  onal Data position e and File of V  Processi zation, Calcuty, Trace on levels, end of the calculation of the cal	ry Languages - Toulus; E-R Model atity Sets, Entity-FRELATIONAL STRUCTURE abase Design using functional estructure - Physoganization, Organ QUERY PROCURANSACTION and Query Opost based optimizansaction Isolation Implementation of COMES is course, students	con, Functions and Procedures, Triggers.  ESIGN  The Relational Algebra, The Tuple Relational Calculus, The The Entity-Relationship Model, Constraints, Removing Relationship Diagrams, Entity-Relationship Design Issues.  DATABASE DESIGN AND STORAGE AND FILE  Features of good relational designs, Functional dependencies, Normal Forms, 1NF, 2NF, 3NF, BCNF, 41 dependencies, Normal For	Dender NF, 51 Heurinicity ansact	gair land gary NF: ary gard ion

CO3	design a database using Relational Query Languages and E-R model	Applying (K3)
CO4	choose the appropriate normal form for the given database.	Analyzing (K4)
CO5	make use of query processing, optimization and Transaction for finding best performance.	Analyzing (K4)

- 1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020.
- 2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2017.

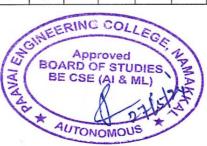
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- 2. Elmasri Ramez and Navathe Shamkant B., "Fundamental Database Systems", 7<sup>th</sup> Edition, Pearson Education, New Delhi, 2017.
- 3. Majumdar, A. K., Bhattacharyya, P, "Database Management Systems", McGraw-Hill, 2017.
- 4. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, New Delhi, 2013.

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CO2	3	3	2	1	2	-	-	-	-	-	-	-	3	2
CO3	3	3	3	2	3	-	-	-	-	-	2	2	3	3
CO4	3	3	2	3	2	-	-	-	-	-	1	-	3	2
CO5	3	3	3	3	3	-	-	-	-	-	2	2	3	3



CL23	403			OPERATI	NG SYSTEMS		3	0	0	:
COU	RSE OB	JECTIVES								
To en	able the s	tudents to								
1.			sic concep	ts and functions o	f operating systems				-	_
2.					cheduling algorithm		of de	eadle	ock	s.
3.	A STATE OF THE STA	and the second s		nagement scheme						
4.				and implementation						
5.					IOT Operating Sys	tems.				
UNIT				TO OPERATIN				4		
Servic	es, Syste	m calls, Sys	tem prog	rams; Processes -	g Systems and types Process concept, Pr munication; Thread	rocess scheduli	ing, C	per	atic	or
	ls - Threa	ding issues.		GEMENT AND		201.64153			T	
UNIT	LIII	MEMOR	Y MANA	GEMENT						or
Main Segme Alloca	Memory entation ation of fr	- Backgrowith paging	ound, Sw g; Virtua hing.	apping, Contiguo	ous memory allocately allocately by the second of the seco					on n
Main Segme Alloca UNIT	Memory entation ation of fr	- Backgrowith paging rames, Thras	ound, Swg; Virtua	apping, Contigue Memory – Bac	kground, Demand	paging, Page	e rep	lace	me	n
Main Segme Alloca UNIT File-S	Memory entation ation of fr Γ IV ystem Int g, Protect	- Backgrowith paging rames, Thras FILE SYSterface - Filetion; File-Systerian;	ound, Swarz; Virtua hing. STEMS e concept stem Imp	Access methods,		paging, Page e, File system on, Allocation	e rep	lace	me:	n
Main Segme Alloca UNIT File-S	Memory entation ation of fi F IV ystem Int g, Protect managem	- Backgrowith paging rames, Thras FILE SYSterface - Filetion; File-Systerian;	ound, Sw g; Virtua hing. TEMS e concept stem Imp acy and po	Access methods,	Directory structure	paging, Page e, File system on, Allocation	e rep	lace	me:	i
Main Segme Alloca UNIT File-S sharin space UNIT I/O Sy - Disk	Memory entation ation of fr  FIV  ystem Int g, Protect managem FV  ystems - Int attachmen	- Backgrowith paging rames, Thras FILE SYS terface - Filetion; File-Synent, efficier I/O SYST	ound, Sw g; Virtua hing. GTEMS e concept stem Imp acy and po EMS e - Applic	Access methods, lementation - Director I/O interface - Disk management	Directory structure	e, File system on, Allocation stems.	mour meth	nting ods,	me:	il
Main Segme Alloca UNIT File-S sharin space UNIT I/O Sy - Disk	Memory entation of fir IV  ystem Integ, Protect managem  T V  ystems - Integral attachments	- Backgrowith paging rames, Thras FILE SYS terface - Filetion; File-Synent, efficier I/O SYST	ound, Sw g; Virtua hing. TEMS e concept stem Imp acy and po EMS e - Applic	Access methods, lementation - Director I/O interface - Disk management	Directory structure ctory implementations, Network file systems, N	e, File system on, Allocation stems.	mour meth	nting ods,	me:	il
Main Segme Alloca UNIT File-S; sharin space UNIT I/O Sy - Disk manag	Memory entation of fr IV  ystem Integ, Protect managem  V  ystems - L  attachmen gement - 1	- Backgrowith paging rames, Thras FILE SYS terface - Filetion; File-Synent, efficier I/O SYST	ound, Sw g; Virtua hing. TEMS e concept stem Imp acy and po EMS e - Applic	Access methods, lementation - Director I/O interface - Disk management	Directory structure ctory implementations, Network file systems, N	e, File system on, Allocation stems.	mour meth	nting ods,	me:	n
Main Segme Alloca UNIT File-S sharin space UNIT I/O Sy - Disk manag	Memory entation of fir IV  ystem Integral grand	- Backgrowith paging rames, Thras FILE SYS terface - Filetion; File-Synent, efficien I/O SYST //O Hardwardent - Disk son RAID - stab	ound, Sw g; Virtua hing. GTEMS e concept stem Imp acy and po EMS e - Applic cheduling e storage	Access methods, lementation - Director ation I/O interface - Disk management	Directory structure ctory implementations, Network file systems, N	e, File system on, Allocation stems.  stem - streams te Management  TOTAL P	mour method	nting ods,	me, Free	n
Main Segme Alloca UNIT File-S sharin space UNIT I/O Sy - Disk manag	Memory entation of fir IV  ystem Int g, Protect managem  T V  ystems - L  attachmed gement - 1  RSE OUT	- Backgrowith paging rames, Thras FILE SYS terface - File tion; File-Synent, efficier I/O SYST //O Hardwardent - Disk so RAID - stab	bund, Sw g; Virtua hing. GTEMS e concept stem Imp acy and po EMS e - Applic cheduling de storage	Access methods, lementation - Director ation I/O interface - Disk managements	Directory structure ctory implementations, Network file systems, N	e, File system on, Allocation stems.  stem - streams to Management  TOTAL P	mour methoder - Per t - Sv	ods,	me s, F Free	iil
Main Segme Alloca UNIT File-S sharin space UNIT I/O Sy - Disk manag  COUI At the	Memory entation of fir IV  ystem Int g, Protect managem  T V  ystems - I. attachme gement - I  end of the identify OS serve apply of deadlood	- Backgrowith paging rames, Thras FILE SYS terface - Filetion; File-System, efficient I/O SYST (O Hardwardent - Disk ser RAID - stable recommendation) appropriate vices and straining from the lifterent metric in the series of	bund, Sw g; Virtua hing. STEMS  e concept stem Impley and po EMS  e - Applic cheduling le storage  udents with	Access methods, Access methods, lementation - Directormance, recoveration I/O interface - Disk management	Directory structure ctory implementations, Network file systems - kernel I/O subsystems - Storage Device - Storage - Storage Device - Storage - Storag	e, File system on, Allocation rstems.  TOTAL P  BT M (Highers Under	mour methoder - Per t - Sv	ods, rforrvap- ODS ded	me s, F Free man spa	iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii
Main Segme Alloca UNIT File-Si sharin space UNIT I/O Sy - Disk manag  COUI At the	Memory entation of fir IV  ystem Int g, Protect managem  I V  ystems - I. attachme gement - I  end of the identify OS servapply of deadlood make upolicies	- Backgrowith paging rames, Thrass FILE SYS terface - Filetion; File-System, efficier I/O SYST //O Hardwardent - Disk so RAID - stab // appropriate vices and straining for the stab // appropriate vices and straining for the stab // se of memo is to address stab // se of memo is to address	bund, Swig; Virtual hing.  STEMS  e concept stem Implex and portion of the concept stem Implementation of the	Access methods, Access methods, lementation - Directormance, recoveration I/O interface - Disk management Il be able to calls for a given sement strategies access and access and access access and access access and access access and access a	Directory structure ctory implementations, Network file systems - kernel I/O subsystems - Storage Device - Storage - Storage Device - Storage	e, File system on, Allocation rstems.  TOTAL P  BT M (Highers Under	mour methoderst Lorent	ods, forrvap- ODS ding	me:   Free	101 iii

CO5	make use of memory management strategies for storing data.	Understanding
		(K2)

- 1. Silberschatz, Galvin, and Gagne, "Operating System Concepts", Tenth Edition, Wiley India Pvt Ltd, 2018.
- 2. William Stallings, "Operating Systems: Internals and Design Principles", 9th Edition Prentice Hall of India, 2018.

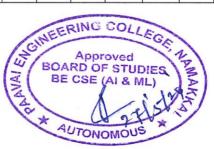
#### REFERENCES

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# CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)

						P	O's						PS	O's
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	3	-	-	-	-	-	-	1	-	-	-	2	1
CO2	3	3	3	-	3	-	-	-	1	-	-	1	2	1
CO3	2	3	3	-	3	-	-	-	1	-	1	2	2	1
CO4	2	3	3	-	3	-	-	-	1	-	2	3	2	1
CO5	3	3	-	-	-	-	-	-	3	3	2	3	1	3



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COU	RSE OBJE	CTIVES		1,19	12 - 1			m e						
To en	able the stud	dents to												
1.	establish t	the knowl	ledge of	f preci	ious re	sources	s of the	envir	onment	and the	eir vari	ous ii	npact	S.
2.	create awa	areness or	n ecosys	stem a	and bio	odivers	sity pre	serve.						
3.	learn scien	ntific and	technol	logica	al solut	tions to	curren	nt day p	ollutio	n issues	S.			
4.	analyze c managem		anges, c	conce	pt of ca	arbon c	credit a	nd the	challen	ges of e	environ	ment	tal	
5.	understan	d green m	naterials	s, ener	rgy cyc	cles and	d the ro	ole of s	ustaina	ble urba	anizatio	on.		
UNIT	I E	NVIRON	MENT	Γ ANI	D NAT	ΓURAI	L RES	OURC	CES					1
			zer-pest	ticide	probl	ems. R	Role of							
- Hots	pots of biod	iversity -	Conser	tion (g vation	genetic of bic	e - spec odiversi	ity: In-	cosyste	em). Di	versity -	- Value	e of b	oiodiv	ersi
- Hots UNIT Pollut manag preven	pots of biod III El ion: Défini gement: Cau ntion of poll	NVIRON tion - air ses - effect ution - E	Conserving Pollution Conservation Conservati	ration (gration)  FAL Fon - we nated to was	genetic n of bio POLLI vater pomeasur ste -So	c - spec odiversi UTION ollution res of un urces-C	cies - ecity: In-s N n - mai	situ and	em). Dir d ex-sit	u conse	- Value ervation polluti	of bi	oiodiv iodive Solid idivid	ersi ersi was
- Hots UNIT Pollut manag preven study	pots of biod TIII El  ion: Défini gement: Cau ntion of poll of local poll	NVIRON tion - air ses - effect ution - E	Conserting MENT pollution cts - correction lectronic plants	tion (greation)  FAL Fon - we not rol rol con trial/A	genetic n of bio POLLI vater peneasur ste -So Agricul	c - spec odiversi UTION ollution res of un urces-C ltural	n - mar rban ar Causes	rine po	em). Dir d ex-sit	u conse	- Value ervation polluti	of bi	oiodiv iodive Solid idivid	ersi
- Hots UNIT Pollut manag prever study UNIT Sustai Sustai ozone	pots of biod III El ion: Défini gement: Cau ntion of poll of local poll IV SI nability - fr nable devel layer deple ept of carbor	iversity - NVIRON tion - air ses - effect ution - El uted site USTAINA com unsus opment g etion. Reg	pollutic cts - cor lectroni — Indus ABILIT stainabi oals-tar gional a arbon for the stainabi for the stainabi oals-tar gional a arbon for the stainabi for the stainabi oals-tar gional a arbon for the stainability of the sta	TAL Fon - wantrol ratio was strial/ATY AT sillity to regets, and locotori	yater pomeasure ste -So Agricul ND EN co susta indicate call en int. Environment en	c - spec odiversi UTION ollution res of un urces-C ltural NVIRO minabilit tors and nvironm	cies - edity: In-sity: In-sity	rine pond induand its  NT  lennium vention issues	em). Did d ex-sit  collution distrial was effected areas. and po	- noise - noise - sstes. Fs- Pollu opment Climat	polluti Role of tition ca	ion. San in ase structure, and age—ns-ca	Solid adividudies prote acid ase str	was was coco
- Hots UNIT Pollut manag prever study UNIT Sustai Sustai ozone Conce UNIT Zero v Sustai	pots of biod III El ion: Défini gement: Cau ntion of poll of local poll IV SU nability - fr nable devel layer deple ept of carbon V SU waste and R nable energy	tion - air ses - effectution - Eluted site - USTAINA com unsus opment go etion. Regalection. Regalection. Regalection. Regalection. Regalection. Concept, y: Non-co	pollution cts - correction in the correction in	TAL Fon - we natrol ratio was strial/A  FY Al  fility to rest, and locotori  FY PF  ar ecoonal Se	yater pomeasure ste -So Agricul ND EN coal en int. Enver RACT.	c - spec odiversi UTION ollution res of un urces-C ltural NVIRO minabilit tors and nvironm vironm ICES , ISO 1 , Green	n - manurban ar Causes  DNME  ity-mill ad intermental mental n  14000 S	rine pond indu and its NT lennium vention issues nanage	em). Did ex-sit	opment Climates industri	polluti Role of t goals, te chan solutio ry-A ca	ion. San image— ns-case state cycle ad tech	Solid dividudies prote acid use strudy.	wassual Fie
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- Hots UNIT Pollut manag prever study UNIT Sustai ozone Conce UNIT Zero v Sustai and se change	pots of biod III El ion: Défini gement: Cau ntion of poll of local poll IV SU nability - fr nable devel layer deple ept of carbon V SU waste and R nable energy equestration, e.  RSE OUTC	iversity - NVIRON tion - air ses - effect tution - El tuted site - USTAINA com unsus opment ge tion. Reg n credit, ca USTAINA concept, y: Non-co n Green E	pollution cts - correction lectroni — Industrational a arbon for a service and the correction continues arbon for a service and the correction are a service and the correction are a service and the correction are a service are a service and the correction are a service are a	tion (greation) FAL F on - we natrol r ic was strial/A FY AI illity to r gets, and locatori FY PI ar econal Sering: S will b	genetice of bioperation of bioperation of bioperation of bioperation of bioperation of bioperation of sustain indicate of the bioperation of the b	c - spec odiversi UTION ollution res of un urces-C ltural NVIRO minabilit tors and nvironmovi	n - man mrban ar Causes  ONME  ity-mill ad intermental mental men	rine pond indu and its NT lennium vention issues nanage	em). Did ex-sit	opment Climates industri	polluting pollut	ion. Si an in ase struct As cycle ad tec	Solid divid udies prote acid ase strudy.  ssessme, emichnological protection of the color of the	ers ersi was ual Fie occo raii udio
- Hots UNIT Pollut manag prever study UNIT Sustai ozone Conce UNIT Zero v Sustai and se change COUI At the	pots of biod FIII EI  ion: Défini gement: Cau ntion of poll of local poll FIV SU nability - fr nable devel layer deple ept of carbor V SU waste and R nable energy equestration, e.  RSE OUTC end of this	iversity - NVIRON  tion - air ses - effect ution - El tuted site - USTAINA  com unsus opment g etion. Reg n credit, ca USTAINA  concept, y: Non-co , Green E	pollution cts - conserving the pollution cts - conserving pollution cts - c	tion (givation (givation (givation fall for wastrial// FY All ility to rest, and location for prince for prince for prince for finger fall for will be wation	yater pomeasureste -So Agricul ND EN o susta indicatocal entint. Environomy, ources Sustain	c - spec odiversi UTION ollution res of un urces-C ltural NVIRO minabilitors and nvironmoviro	cies - ecity: In-sity: In-sity	rine pond indu and its NT lennium vention issues nanage	em). Did d ex-sit  collution distrial was effected a areas. and poment in  Environergy C Socio	opment Climates industri	polluting pollut	ion. Si an in ase struct As cycle ad tecest Level erstar	Solid divid acid acid ase strudy.  Seesan e, emichnological or seed or	was ual Fie occorain udie
- Hots UNIT Pollut manag prever study UNIT Sustai ozone Conce UNIT Zero v Sustai and se change	pots of biod III El ion: Défini gement: Cau ntion of poll of local poll IV SU nability - fr nable devel layer deple ept of carbon V SU waste and R nable energy equestration, e.  RSE OUTC	iversity - NVIRON  tion - air ses - effect ution - El tuted site - USTAINA  com unsus opment g etion. Reg n credit, ca USTAINA  concept, y: Non-co , Green E	pollution cts - conserving the pollution cts - conserving pollution cts - c	tion (givation (givation (givation fall for wastrial// FY All ility to rest, and location for prince for prince for prince for finger fall for will be wation	yater pomeasureste -So Agricul ND EN o susta indicatocal entint. Environomy, ources Sustain	c - spec odiversi UTION ollution res of un urces-C ltural NVIRO minabilitors and nvironmoviro	cies - ecity: In-sity: In-sity	rine pond indu and its NT lennium vention issues nanage	em). Did d ex-sit  collution distrial was effected a areas. and poment in  Environergy C Socio	opment Climates industri	polluting pollut	ion. Si an in ase struct As cycle ad tecest Level erstar	Solid divid udies prote acid ase strudy.  ssessme, emichnological protection of the color of the	was ual Fie occorain udio

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CO4	well- with all advislance of for tacking lacks advancement	Applying (V2)
CO4	apply sustainable development for technological advancement	Applying (K3)
	and societal development.	
CO <sub>5</sub>	measure the sustainability practices for green energy cycles.	Analyzing (K4)
TEXT	BOOKS	
1.	Benny Joseph, "Environmental Science and Engineering", Tata M	AcGraw Hill, 1st edition, 2017.
2.	Gilbert M. Masters, Wendell P. Ela, "Introduction to Environment	ntal Engineering and Science",
	3 <sup>rd</sup> edition, Pearson, 2022.	
REFE	RENCES	
1.	William P. Cunningham and Mary Ann Cunningham, "Envir	ronmental Science: A Global
	Concern", McGraw Hill, 16th edition, 2023.	
2.	C.S. Rao, "Environmental Pollution and Control Engineering",	New Age International (P) ltd
	Publication, New Delhi, 4th edition, 2021.	
3.	Erach Bharucha, "Textbook of Environmental Studies", Universit	ties Press Pvt. Ltd., Hyderabad,
	3rd edition, 2020.	
4.	Rajagopalan, R, "Environmental Studies-From Crisis to Cure",	Oxford University Press, 4th
	Edition, 2015.	
CO-P	O MAPPING:	
Mapp	ing of Course Outcome (CO's) with Programme Outcomes (PC	O's) and Programme Specific
	Outcomes (PSO's)	
	(1/2/3 indicates strength of correlation) 3-Strong 2-Me	dium 1 Wook

	(1/2/3	maic	cates	strenş	gin oi	corre	lation	) 3-31	rong,	Z-IVIE	uium,	1- W 65	IK.	
		-2 1				P	O's						P	'SO's
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	1	-	-	-	2	-	-	1	1	<b>2</b> 9	-	2	2
CO2	-	2	-	-	1	1	-	1	-	-	-	-	2	2
CO3	2	-	1	1	-	-	-	2	-	-	-	2	2	2
CO4	-	2	-	-	1	-	3	1	1	-	1	1	2	2
CO5	2	2	_	1	-	-	2	1	-	-	-	1	2	2



CLZS	404	COMPUTER NETWORKS		3	0	2	4
COU	RSE OBJ	ECTIVES					
To ena	able the st	tudents to					
1.	unders	tand the function of different layers of OSI model.					_
2.	knowa	about the components required to build different typ	es of networks.				
3.		he various routing protocols operation.	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2				-
4.	learn t	ne flow control and congestion control algorithms.					
5.		e knowledge of application layer and its working pri	nciples				
UNIT	-	FUNDAMENTALS & PHYSICAL LAYER					0
			11 .	Tr.			9
TCP/II	P protoco	Pata communications, Networks, Network Types - F l suit - Physical Layer: Overview of Data and signal	rotocol Layering	g - The	OSI	Mo	del,
UNIT		DATA LINK LAYER	s - Transmission	media	- SW	ricin	ng. 9
							-
		ol - Framing, Flow Control, Error Control, HDLC; N					
Conne	cting Dev	ernet, Fast Ethernet, Gigabit Ethernet - Wireless	LANS - IEEE 8	02.11,	Blu	etoot	:h -
UNIT		NETWORK LAYER	Act of the Company			1	
							a
	I address	ing . IPVA Addresses IDv6 Addresses Internet must	seal Internation	1.	(ID	I ID	9
Transit	ll address	ing - IPv4 Addresses, IPv6Addresses - Internet prot	ocol - Internetwo	rking	(IPv4	l, IPv	76),
Transit	tions fron	n IP4 to IP6 – ICMP – IGMP – Forwarding - Unicas	ocol - Internetwo	rking	(IPv4 Multi	l, IPv	76),
Transit	g protocol	n IP4 to IP6 – ICMP – IGMP – Forwarding - Unicas	ocol - Internetwo	rking ocol - ]	(IPv4 Multi	I, IPv	76), ing
Transit routing UNIT	g protocol	n IP4 to IP6 – ICMP – IGMP – Forwarding - Unicas TRANSPORT LAYER	ting routing proto	ocol - I	Multi	cast	76), ring
Transit routing UNIT Duties	g protocol VIV of Trans	n IP4 to IP6 – ICMP – IGMP – Forwarding - Unicas  TRANSPORT LAYER  port Layer - User datagram protocol (UDP) - Trai	ting routing proto	l prote	Multi	(TCF	(6), ing
Transit routing UNIT Duties Connection	g protocol VIV of Trans	n IP4 to IP6 – ICMP – IGMP – Forwarding - Unicas TRANSPORT LAYER	ting routing proto	l prote	Multi	(TCF	(6), ing
Transit routing UNIT Duties Connection	of Transction esta-Quality	TRANSPORT LAYER  port Layer - User datagram protocol (UDP) - Translation Connection release - Congestion control	ting routing proto	l prote	Multi	(TCF	(6), ing
Transit routing UNIT Duties Connect RED) -	of Transction estate  Quality	TRANSPORT LAYER  port Layer - User datagram protocol (UDP) - Transhishment, Connection release - Congestion control of Service - Techniques to Improve QoS.  APPLICATION LAYER	nsmission contro	l protovoidar	Multi	(TCFDEC	9 (6), ing 9 (7) -
Transit routing UNIT Duties Connec RED) - UNIT Applic	of Transction esta-Quality  V ation Lay	n IP4 to IP6 – ICMP – IGMP – Forwarding - Unicas  TRANSPORT LAYER  port Layer - User datagram protocol (UDP) - Translishment, Connection release - Congestion control of Service - Techniques to Improve QoS.	nsmission contro	l protovoidar	Multi	(TCFDEC	9 (6), ing 9 (7) -
Transit routing UNIT Duties Connec RED) - UNIT Applic	of Transction esta-Quality  V ation Lay	TRANSPORT LAYER  port Layer - User datagram protocol (UDP) - Transhishment, Connection release - Congestion control of Service - Techniques to Improve QoS.  APPLICATION LAYER  er protocols: DNS - Email protocols (SMTP - POP)	nsmission contro	l protovoidar	Multi-	(TCFDEC	9 (6), ing 9 (7) -
Transit routing UNIT Duties Connect RED) - UNIT Applies (HTTP	of Transction estate Quality  V ation Lay	TRANSPORT LAYER  port Layer - User datagram protocol (UDP) - Transhishment, Connection release - Congestion control of Service - Techniques to Improve QoS.  APPLICATION LAYER  er protocols: DNS - Email protocols (SMTP - POP)	nsmission control  1 - Congestion a	l protovoidar	Multi-	(TCFDEC	9 '') - bit, 9 //W
Transit routing UNIT Duties Connec RED) - UNIT Applic (HTTP	of Transction esta-Quality Vation Lay P, HTTPS	TRANSPORT LAYER  port Layer - User datagram protocol (UDP) - Transblishment, Connection release - Congestion control of Service - Techniques to Improve QoS.  APPLICATION LAYER  fer protocols: DNS - Email protocols (SMTP - POP.) - SNMP.	nsmission control - Congestion at 3 - IMAP - MIM	l protovoidar E) – F	Multi- pcol pce (I	(TCFDEC	9 '') - bit, 9 //W
Transit routing UNIT Duties Connect RED) - UNIT Application (HTTP) LIST (	of Transction estated under the control of the cont	TRANSPORT LAYER  port Layer - User datagram protocol (UDP) - Transhishment, Connection release - Congestion control of Service - Techniques to Improve QoS.  APPLICATION LAYER  Ter protocols: DNS - Email protocols (SMTP - POP) - SNMP.  ERIMENTS  the network topologies (Bus, Ring, Star and Mesh)	nsmission contro  1 - Congestion a  3 - IMAP - MIM  TOTA  using Cisco Pack	l protovoidar  E) – F	Multi-	(TCF) WW	9 '6), sing 9 '7') - bit, 9 /W
Transit routing UNIT Duties Connect RED) - UNIT Application (HTTP) LIST (	of Transction esta-Quality V ation Lay P, HTTPS Simulate There are	TRANSPORT LAYER  port Layer - User datagram protocol (UDP) - Transblishment, Connection release - Congestion control of Service - Techniques to Improve QoS.  APPLICATION LAYER  Ter protocols: DNS - Email protocols (SMTP - POP) - SNMP.  ERIMENTS  the network topologies (Bus, Ring, Star and Mesh) at 20 PC's in your network. Five PC's are connected to the start of the s	nsmission control 1 - Congestion a  B - IMAP - MIM  TOTA  using Cisco Pack to one Ethernet h	l protevoidar  E) – F	TP – cer. d five	(TCF)  WW  DS	9 9) - bit, 9 /W 45
Transit routing UNIT Duties Connect RED) - UNIT Application (HTTP) LIST (	of Transction esta-Quality Vation Lay OF EXPI Simulate There are	TRANSPORT LAYER  port Layer - User datagram protocol (UDP) - Transhishment, Connection release - Congestion control of Service - Techniques to Improve QoS.  APPLICATION LAYER  Ter protocols: DNS - Email protocols (SMTP - POP) - SNMP.  ERIMENTS  the network topologies (Bus, Ring, Star and Mesh)	asmission control  I - Congestion a  B - IMAP - MIM  TOTA  using Cisco Pack to one Ethernet herate switch and l	l protevoidar  E) – F  L PE  tet Tra  ub, and both th	Multi- mocol TP - RIO Cer. d five	(TCF) (TCF) DEC	9 2) - bit, 9 7W 45

- remaining 10 PC's are connected directly to one of the two switches. How many Ethernet segments are there? Implement this scenario using cisco packet tracer.
- 3. Simulation of error correction code (like CRC).
- 4. Implement bit stuffing and byte stuffing using C program.
- 5. Write a code to implement distance vector routing algorithm.
- 6. Write a code to implement border gateway protocol (BGP).
- 7. Applications using TCP sockets like:
  - a. Echo client and Echo server
  - b. Chat
- 8. Write a HTTP web client program to download a web page using TCP sockets.

9. Configure a Web server, DHCP server and a DNS server all together in a single simulation through which IP have to be allocated for the host through DHCP server, Conversion of Canonical Name to IP address to be done by DNS server and Access to the webpage has to be given by web server using Cisco Packet Tracer.

		*	TOTAL PERIODS	75
COUR	SE OUTCOMES			
At the	end of this course, students w	II be able to	BT Mapped (Highest Level)	
CO1	explain the basic layers and	ts functions in computer networks.	Applying (	(K3)
CO2	demonstrate the knowledge of layer.	of flow control algorithms at data link	Analyzing (	(K4)
CO3	apply the suitable routing alg	gorithms for the given network.	Applying (	(K3)
CO4	develop a client/server app algorithms for end-end com	lication using TCP/UDP and design nunication.	Applying (	(K3)
CO5	implement the various applie	cation layer protocols.	Analyzing (	(K4)

# **TEXT BOOKS**

- 1. Behrouz A. Forouzan, "Data Communications and Networking with TCP/IP Protocol Suite", Sixth Edition TMH, 2022.
- 2. James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Eighth Edition, Pearson Education, 2021.

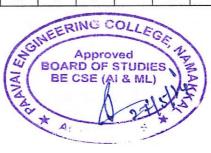
#### REFERENCES

- 1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Sixth Edition, Morgan Kaufmann Publishers Inc., 2019.
- 2. William Stallings, "Data and Computer Communications", Tenth Edition, Pearson Education, 2014.
- 3. Nader F. Mir, "Computer and Communication Networks", Second Edition, Prentice Hall, 2014.
- 4. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open-Source Approach", McGraw Hill, 2012.

#### **CO-PO MAPPING:**

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)

			PSO's											
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	1	1	2	-	-	-	-	-	3	1	3	-	3
CO2	2	3	3	2	-	-	-	-	1	3	1	3	2	3
CO3	3	3	2	2	-	-	-	1	1	3	1	3	2	3
CO4	3	3	3	2	-	-	-	1	1	3	1	3	2	3
CO5	3	3	3	2	3	2	-	2	1	3	1	3	3	3



CL23405	5	DA	TABASE MAI LABO	NAGEMENT ORATORY	SYSTEM		0	0	4	2
COURS	E OBJECTI	VES								
To enable	e the students	to								
1.	explore and i	implement in	portant com	mands in SQ	L with key	and con	strair	its.		
2. 1	earn the usa	ge of nested	and joint quer	ries.						
3.	acquire the k	nowledge of	Triggers, Vie	ews and Curs	sor.					
4. <u>f</u>	familiar with	the use of a	database Con	nectivity						
LIST OF	EXPERIM	ENTS								
2. C 3. C a 4. C	Create a set on the data ggregate fundate fund	f tables, add abase tables actions. abase tables	ws using SQI foreign key c using differen and explore s	constraints and to where cla	d incorpor	ate refer				
7. E 8. V 9. C 10. E	Vrite user de Execute comp Vrite SQL Tr Create View a Database Prop	fined function plex transact riggers for ir and index fo gramming: I	and explore not and stored ons and realized sert, delete, and database tabinalized and Explicit and Expension of the store	natural, equi procedures ze DCL and nd update op les with a lan xplicit Curso	in SQL. TCL commorations in	nands. a databa		ble.		
7. E 8. V 9. C 10. E	Vrite user de Execute comp Vrite SQL Tr Create View a Database Prop	fined function plex transact riggers for ir and index fo gramming: I	and explore not not and stored ons and realized sert, delete, and database tab	natural, equi procedures ze DCL and nd update op les with a lan xplicit Curso	in SQL. TCL commorations in	nands. a databa	ds. T	ble. OTA		60
7. E 8. V 9. C 10. D 11. D	Vrite user de Execute comp Vrite SQL Tr Create View a Database Prop Database Con	fined function olex transact riggers for in and index for gramming: In nectivity wi	and explore none and stored ons and realized sert, delete, and database tability and Explicit an	natural, equi procedures ze DCL and nd update op les with a lan xplicit Curso	in SQL. TCL commorations in	nands. a databa	rds. T PEI	'OTA RIOD	S	
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7. E 8. V 9. C 10. E 11. E  COURSI At the end CO1 CO2 CO3 CO4	Vrite user de Execute composition Vrite SQL Transcription SQL Tran	fined function of the color transact riggers for in and index for gramming: I the color transactivity with the color transactivity w	and explore nons and stored ons and realized sert, delete, and database tabin plicit and Explored to the Front End of the Front End of the Bole with variand advanced Quantitative of the Pront End of the Bole with varianced Quantitative of the End of the	natural, equiprocedures ze DCL and update oples with a lar xplicit Curso Tools.	in SQL. TCL commore relations in rege number rs.  straints. iques and and Ti	Join	T PEI (Hig	FOTA RIOD F Maj ghest	pped Leve ing ( ing (	K3)
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7. E 8. V 9. C 10. E 11. E  COURSI At the end CO2 CO3 CO4 CO-PO I	Vrite user de Execute composition Vrite SQL Transcription SQL Tran	fined function of the color transact riggers for in and index for gramming: Innectivity with the color of the	and explore nons and stored ons and realized sert, delete, and database table in plicit and Exh Front End on the store in	natural, equipose procedures ze DCL and nd update oples with a lar xplicit Curso Tools.  Ous key consous Yechnology Technology Techn	in SQL. TCL commorerations in rege number rs.  straints. iques and and Traints.	Join rigger	T PEI (Hig	TOTA RIOD T Maj ghest Apply Apply	pped Leve ing ( ing (	K3 K3 K3

		PO's													
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	3	2	2	1	2	1-1	-	-	-	-	-	-	3	2	
CO2	3	3	2	2	3	NO	coir	-	-	-	-	-	3	3	
CO3	3	3	3	30	EST	-	LEG	5	1	1	-	-	3	2	
CO4	3	3	3	13/	BOAR	020F	oved STUDIE: Al & ML)	6 2	2	2	1	2	3	3	

\* AUTONOMOUS

CL2	3406	OP	ERATING SYSTEMS LABORATORY	0	0	4	2
COL	JRSE OBJI	ECTIVES					
To en	nable the stu	idents to					
1.	execute s	shell programm	ing and the use of filters in the UNIX environmen	t.			
2.			n c using system calls and to process creation and strate scheduling algorithms.	inter pro	ocess		
3.	impleme	nt file system r	elated system calls.				
4.		iar with implen Ilock avoidance	entation of CPU scheduling algorithms, page repla-	acement	algor	ithms	
LIST	OF EXPE	CRIMENTS					
1	. Basics o	f UNIX comma	nds.				
2	2. Shell Pro	ogramming.					

- 3. Implement the following CPU scheduling algorithms.
  - a) FCFS b) SJF c) Priority d) Round Robin
- 4. Implement the following file allocation strategies.
  - b) Sequential b) Indexed c) Linked
- 5. Implement Semaphores.
- 6. Implement Bankers Algorithm for Dead Lock Avoidance and Deadlock Detection.
- 7. Implement the following page replacement algorithms.
  - c) FIFO b) LRU c) Optimal
- 8. Implement Paging Technique of memory management.
- 9. Implement Shared memory and IPC.
- 10. Implement Thread and Synchronization

		TOTAL PERIODS 60
COUI	RSE OUTCOMES	
At the	end of this course, students will be able to	BT Mapped (Highest Level)
CO1	compare the performance of various CPU scheduling algorithms for a given applications.	Applying (K3)
CO2	implement the file allocation strategy.	Applying (K3)
CO3	implement deadlock avoidance and detection algorithms.	Applying (K3)
CO4	analyse different paging techniques for efficient memory allocation.	Applying (K3)
CO.P	O MAPPINC:	

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

		PO's												
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	3	-	-		-	2	1	3	2	1
CO2	3	3	3	1	2	-	-	-	-	2	2	3	2	1
CO3	3	2	3	2	3	-	-	2	2	2	2	3	2	1
CO4	3	3	3	1	2	NG C	0//-	-	-	2	2	3	2	1

Approved BOARD OF STUDIE BE CSE (AI & ML

GE2340	1		PROFESSIONAL DEVELOPMEN	TII	0	0	2
COURS	E OBJECTIV	/ES					
To enable	e the students	to					
1			vioral skills to survive in corporate world	ld.			
2.		Control of the Contro	and speaking skills to face the interview		way	_	-
			pal aptitude tests to get placed in Tier I o				
			skills to get placed in reputed companie				
UNIT I		ING SKI					T
Fmail w	riting: Fiving	and cance	lling appointments; Paper submission	· ·	•	•	
Business		on; Stress r	nanagement; Body language; Dress cod				
UNIT II	PRES	ENTATIO	ON SKILLS				
Group dis	scussion level	IL; JAM L	Attack to the state of the stat	play; Face to f	ace i	nter	view
UNIT III	I QUAN	TITATIV	E APTITUDE - I				
Percentag	Te	beed and d	istance; Trains; Boats and streams; Rati	o and proportion	ı; Pa	rtne	rship
UNIT IV Seating a	LOGIe	CAL REA					T
UNIT IV Seating	LOGIO	CAL REA	SONING	gisms; Matchin	g de	fini	tions
UNIT IV Seating a Statement	LOGIC arrangement; ts and argumen	CAL REA Arithmetic	SONING		g de	fini	tions
UNIT IV Seating a Statement COURSE At the end	LOGIC  arrangement; ts and argument  COUTCOME	CAL REA Arithmetic nts.	SONING	gisms; Matchin	g de	efini DDS	tions
Seating a Statement  COURSE At the end	LOGIC  Arrangement; ts and argument  COUTCOME d of this course  hterpret the per	CAL REA Arithmetic nts.  CS e, students	soning; Character puzzle; Syllog will be able to evelopment through various activities.	gisms; Matchin  TOTAL PI	g de ERIC Iappe	efini ODS ed vel)	tions 3
Seating a Statement  COURSE At the end  CO1 in CO2 ex	E OUTCOME d of this course hterpret the per	CAL REA Arithmetic nts.  CS e, students rsonality deng and liste	soning; Character puzzle; Syllog will be able to evelopment through various activities. ening skills to excel in their jobs.	TOTAL PI  BT M (Highes Under	g de ERIC Iappe	DDS ed vel)	tions 3 (K2
Seating a Statement  COURSE At the end  CO1 in CO2 ex CO3 de in	LOGIC  Arrangement;  Its and argument  COUTCOME  It of this course  Atterpret the per  Examine speaking  Evelop the quarterview.	CAL REA Arithmetic ints.  CS e, students resonality de ing and liste iantitative	soning; Character puzzle; Syllog will be able to evelopment through various activities. ening skills to excel in their jobs. skills and analytical skills to face the	gisms; Matchin  TOTAL PI  BT M (Highes Under	g de ERIC Iappe st Le	DDS ed vel) ding	(K2
Seating a Statement  COURSE At the end  CO1 in CO2 ex CO3 de in CO4 ex	LOGIC  Arrangement;  Its and argument  COUTCOME  It of this course  Atterpret the per  Examine speaking  Evelop the quarterview.	CAL REA Arithmetic ints.  CS e, students csonality de ing and liste cantitative oning abilit	sconing; Character puzzle; Syllog will be able to evelopment through various activities. ening skills to excel in their jobs. skills and analytical skills to face the ies by scoring exceeded percentage to g	gisms; Matchin  TOTAL PI  BT M (Highes Under	g de ERIO Lappe St Le restano	DDS  ed  vel)  ing	(K2 (K4 (K3
Seating a Statement  COURSE At the end  CO1 in CO2 ex CO3 de in CO4 ex	arrangement; ts and argument  E OUTCOME d of this course hterpret the per examine speaking evelop the quaterview. extend the reason	CAL REA Arithmetic ints.  CS e, students csonality de ing and liste cantitative oning abilit	sconing; Character puzzle; Syllog will be able to evelopment through various activities. ening skills to excel in their jobs. skills and analytical skills to face the ies by scoring exceeded percentage to g	BT M (Highes Under	g de ERIO Lappe St Le restano	DDS  ed  vel)  ing	(K2 (K4 (K3
Seating a Statement  COURSE At the end  CO1 in CO2 ex CO3 de in CO4 ex pl  TEXT BO	arrangement; ts and argument  E OUTCOME d of this course hterpret the per examine speaking evelop the quaterview. extend the reason laced in repute	CAL REA Arithmetic ints.  CS e, students resonality de ing and liste interactive interactive oning abilit d compani	sconing; Character puzzle; Syllog will be able to evelopment through various activities. ening skills to excel in their jobs. skills and analytical skills to face the ies by scoring exceeded percentage to g	BT M (Highes Under A et Under	g de ERIO Lappe St Le restano	DDS  ed  vel)  ing	(K2 (K4 (K3
UNIT IV Seating a Statement  COURSE At the end CO1 in CO2 ex CO3 de in CO4 ex pl TEXT BO 1. A	arrangement; ts and argument  E OUTCOME d of this course terpret the per examine speaking evelop the quaterview. extend the reason laced in repute OOKS garwal, R.S. "	CAL REA Arithmetic ints.  CS e, students resonality de ing and liste cantitative oning abilit d compani	will be able to evelopment through various activities. ening skills to excel in their jobs. skills and analytical skills to face the skills are serviced by scoring exceeded percentage to get.	BT M (Highes Under A et Under	g de ERIO Lappe St Le restano	DDS  ed  vel)  ing	(K2 (K4 (K3
Seating a Statement COURSE At the end CO1 in CO2 ex CO3 de in CO4 ex pl TEXT BC 1. A 2. A REFERE	arrangement; ts and argument  E OUTCOME d of this course hterpret the per evelop the quaterview. extend the reaso laced in repute OOKS garwal, R.S. " garwal, R.S. "	CAL REA Arithmetic ints.  CS e, students conality de ing and liste cantitative oning abilit d compani Objective 'Quantitati	soning; Character puzzle; Syllog will be able to evelopment through various activities. ening skills to excel in their jobs. skills and analytical skills to face the ies by scoring exceeded percentage to ges.  General English", S.Chand & Co.2021.	BT M (Highes Under A et Under	g de ERIO Lappe St Le restano	DDS  ed  vel)  ing	(K2 (K4 (K3

3. "Word Power Made Easy By Norman Lewis", Wr.Goyal Publications, 2021.

# CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)

,						P	O's						PS	O's
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	-	-	-	-	-	3	3	2	3	-	3	1	2
CO2	-	-	-	-	-	-	2	3	2	3	-	3	1	2
CO3	3	2	2	-	-	1	-	-	-	-	2	-	2	2
CO4	2	3	3	2	-	3	3	1	-	1	2	-	2	2

