Learning Outcomes based Curriculum Framework (LOCF)

for

Master of Technology (Computer Science) M.Tech. (CS)

(w.e.f. 2022-23)



Department of Computer Science and Information Technology School of Technology MAULANA AZAD NATIONAL URDU UNIVERSITY

1. Vision and Mission

1.1 Vision

To meet the requirements of the society by imparting knowledge, ethics and moral values with a holistic approach.

1.2 Mission

To impart quality education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens embedded with ethical values.

1.3 Strategies for Attaining the Vision and Fulfilling the Mission

Following strategies will be used to ensure the accomplishment of the stated vision and mission:

- 1. To create an ambiance for healthy teaching-learning process and attract the motivated students to the Department of Computer Science and Information Technology
- 2. Ensure that the curriculum followed is comparable to the relevance of local, national, regional and global development
- 3. To motivate the potential faculty members/ educators who are constantly upgrading their pedagogical approaches to motivate students and to enhance learning among them
- 4. Provide opportunities to students for global exposure, industrial internships, project based and research-based learning

2. Program Educational Objectives

Program Educational Objectives (PEOs) are broad statements that describe the career and professional accomplishments that CS&IT Department is preparing its graduates to achieve during the graduation. Following four PEOs are defined as:

PEO 1. To train the graduates to acquire in depth knowledge of fundamental concepts and programming skills for holistic development.

PEO 2. To prepare the graduates for productive careers in software industry, corporate sector, Government Organizations.

PEO 3. To prepare graduates to acquire excellent computing ability so that they can analyze, design and create Solutions for real time problems.

PEO 4. To apply the current tools and techniques to create systems for solving Industry oriented problems.

3. Program Outcomes (POs)

Program outcomes are the narrower statements that describe what students are expected to know and be able to do upon graduation. POs represent the knowledge, skills and attitudes the students should have at the end of a program. Following are the statements for POs for computer application program. At the time of completing their degree requirements, students will be able to:

- **PO₁:** Apply the knowledge of Mathematics, Science, and Engineering fundamentals, and an engineering specialization to solution of complex engineering problems **(Engineering Knowledge)**.
- **PO**₂: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences (**Problem analysis**).
- **PO₃:** Design of solutions for complex engineering problems and design of system components or processes that meet the specified needs with appropriate considerations of public health and safety, and cultural, societal, and environmental considerations (**Design/development of solutions**).
- **PO**₄: Use research-based methods including design of experiments, analysis and interpretation of data and synthesis of information leading to logical conclusions (Conduct investigations of complex problems).
- **PO**₅: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling complex engineering activities with an understanding of limitations (**Modern tool usage**).
- **PO**₆: Apply reasoning within the contextual knowledge to access societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice (**The engineer and society**).
- **PO**₇: Understand the impact of the professional engineering solutions in the societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments (Environment and sustainability).
- **PO**₈: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (**Ethics**).
- **PO**₉: Function effectively as an individual independently and as a member or leader in diverse teams, and in multidisciplinary settings (**Individual and team work**).
- **PO**₁₀: Communicate effectively on complex engineering activities with the engineering community and with society at large such as being able to comprehend and write effective reports and design documentation, make effective oral presentations, and give and receive clear instructions (**Communication**).
- **PO**₁₁: Demonstrate knowledge and understanding of engineering management principles and apply those to one's own work as a member and leader of a team to manage projects in multidisciplinary environments (**Project management and finance**).
- **PO**₁₂: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change (**Life-long Learning**).

4. Program Specific Outcomes (PSOs)

Program Specific Outcomes (PSOs) are the statements that define outcomes of a program which make students realize the fact that knowledge and techniques learnt in a specific course has direct implication for the betterment of society and its sustainability.

- **PSO 1:** The ability to design and develop applications using the knowledge of Mathematics, Science and Engineering fundamentals.
- **PSO 2:** Ability to test and analyze the quality of developed applications and to integrate them in order to evolve a larger computing system.
- **PSO 3:** Apply appropriate techniques, resources, and modern engineering and IT tools to address societal, health, safety, legal, and cultural issues.
- **PSO 4:** To analyze and assess various functional and technical security challenges in protecting various digital assets and infrastructure in the internet era and to design and develop innovative technological solutions for the same

PSOs have to be attained by the students in due course of the two years program either as part of their Core, Discipline Specific Electives, Tools and techniques or as part of their various levels of seminar/ internship and project work.

5. Mapping between PEOs, POs and PSOs

The following Table lists the relationships between the PEOs, POs. and PSOs. The attainment of POs can be viewed as a strategy for attaining the PEOs. Each PEO is supported by multiple POs to ensure strength in compliance. Also, the relationship between individual PO and PEOs can vary between **Reasonable (1)** and **Strong (3)**.

DEOg		POs								PSOs						
PEUS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
PEO1	2	2	3	3	2	2	1	1	2	1	1	2	2	1	1	2
PEO2	2	2	3	1	3	3	1	1	2	1	2	1	2	2	3	1
PEO3	2	3	2	3	3	2	1	1	3	2	1	2	1	3	1	2
PEO4	3	2	2	1	3	1	1	1	3	2	2	2	3	2	1	3

- 1 Reasonable
- 2 Significant
- 3 Strong

6. Course Outcomes (COs)

Course Outcomes are narrower statements that describe what students are expected to know and be able to do at the end of the course. Course outcomes are defined for all courses as part of the syllabus for the course and are measured through performance on assignments, written and oral presentation reports related to individual and team projects and through the mid-term and semester end examinations. Detailed syllabi for each course associated with Course Objectives and Course Outcomes has been for specific outcomes associated with the course. Attaining the COs is at the heart of the educational activity. If COs of individual courses are successfully attained and the curriculum has been designed to achieve the Program Outcomes, then attainment of the POs is also ensured. An effective Assessment Plan has been devised to meet the objective, quantitative and independent measures to demonstrate that all POs and PEOs are being attained by the program.

7. Continuous Quality Improvement and Assessment Plan

The purpose of the Assessment Plan is to ensure attainment of all Program Outcomes (POs) and also the attainment of the Program Educational Objectives (PEOs) and to independently confirm that the POs and PEOs are being attained. Periodic monitoring of progress allows faculty members and the leadership to take corrective actions where the POs and PEOs are not meeting established targets. The process consists of assessing and evaluating the extent to which the student outcomes are being attained. The results of these assessments and evaluations are subsequently used as the primary inputs for making improvements to the program.

MAULANA AZAD NATIONAL URDU UNIVERSITY SCHOOL OF TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & IT

M.Tech. (Computer Science)

General, Course structure & Theme & Semester-wise credit distribution

A. Definition of Credit:								
1	1 Hr. Lecture (L) per week	1 credit						
2	1 Hr. Tutorial (T) per week	1 credit						
3	2 Hours Practical (Lab)/week	1 credit						

B. Range of credits:

A student requires to complete total 80 credits to be eligible to get Post Graduate degree in Computer Science.

C. Structure of Post graduate Computer Science program:							
S.	Course Tupo	Credit Breakup for	Crodita				
No.	course rype	M.Tech. Students	Creaits				
1	Program Core Course	PC	16				
2	Program Elective Course	PE	20				
3	Research Methodology & IPR	RMIPR	2				
4	Generic Elective	GE	8				
5	Laboratory	LAB	8				
6	Mini Project with Seminar	MPS	2				
7	Dissertation	DISS	24				
	Total						

MAULANA AZAD NATIONAL URDU UNIVERSITY

DEPARTMENT OF CS&IT SCHEME OF INSTRUCTIONS, EXAMINATION & EVALUATION (Effective for Batch Admitted from 2022-23 Academic Year)

M.Tech. (Computer Science)

Total Credits (2 Year Course): 80

I. INDUCTION	I. INDUCTION PROGRAM (PLEASE REFER APPENDIX-A FOR GUIDELINES)						
Induction Program	3 Weeks duration						
(mandatory)	(Please refer Appendix-A for guidelines & also details available in the						
	curriculum of Mandatory courses)						
Induction program for	Physical activity						
students to be offered right	Creative Arts						
at the start of the first year.	 Universal Human Values 						
	 Literary 						
	 Proficiency Modules 						
	 Lectures by Eminent People 						
	 Visits to local Areas 						
	 Familiarization to Dept./Branch & Innovations 						

Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

Initial Phase	
Time	Activity
Day 0	
Whole day	Students arrive - Hostel allotment. (Preferably do pre-allotment)
Day 1	
09:00 am - 03:00 pm	Academic registration
04:30 pm - 06:00 pm	Orientation
Day 2	
09:00 am - 10:00 am	Diagnostic test (for English etc.)
10:15 am - 12:25 pm	Visit to respective depts.
12:30 pm - 01:55 pm	Lunch
02:00 pm - 02:55 pm	Director's address
03:00 pm - 05:00 pm	Interaction with parents
03:30 pm - 05:00 pm	Mentor-mentee groups - Introduction within group. (Same as Universal
	Human Values groups)

Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods within the Induction Program. We first show a typical daily timetable.

7

Sessn.	Time	Activity	Remarks
Day 3 onwards	5		
-	06:00 am	Wake up call	
Ι	06:30 am - 07:10 am	Physical activity (mild exercise/yoga)	
	07:15 am - 08:55 am	Bath, Breakfast, etc.	
II	09:00 am - 10:55 am	Creative Arts / Universal Human Value	es
		Half the groups do Creative Ar	ts
III	11:00 am - 12:55 pm	Universal Human Values /	
	-	Creative Arts Complemen	tary alternate
	01:00 pm - 02:25 pm	Lunch	-
IV	02:30 pm - 03:55 pm	Afternoon Session See below.	
V	04:00 pm - 05:00 pm	Afternoon Session See below.	
	05:00 pm - 05:25 pm	Break / light tea	
VI	05:30 pm - 06:45 pm	Games / Special Lectures	
	06:50 pm - 08:25 pm	Rest and Dinner	
VII	08:30 pm - 09:25 pm	Informal interactions (in hostels)	

Sundays are off and Saturdays have the same schedule as above or have outings.

Afternoon Activities (Non-Daily)

The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:

- 1. Familiarization to Dept./Branch & Innovations
- 2. Visits to Local Area
- 3. Lectures by Eminent People
- 4. Literary
- 5. Proficiency Modules

Here is the approximate activity schedule for the afternoons (may be changed to suit local needs):

ACTIVITY		Session	Kellialks
Familiarization wit	h Dept/Branch		
& Innovations	IV		For 3 days (Day 3 to 5)
Visits to Local Area	ı IV, V a	ind VI	for 3- days
			For 3 days - interspersed (e.g., 3 Saturdays)
Lectures by Emine	nt People IV		As scheduled - 3-5 lectures
Literary (Play / Bo	ok Reading / Lecture)	IV	For 3-5 days
Proficiency Module	es V		Daily, but only for those who need it
<mark>Closing Phase</mark>			
Time	Activity		
Last But One Day			
08:30 am - 12 noon	Discussions a	nd finaliza	ation of presentation within each group
02:00 am - 05:00 p	om Presentation l own (about 10	by each gr 0 student	roup in front of 4 other groups besides their ts)
Last Day			
Whole day Exa	minations (if any). May be	expanded	d to last 2 days, in case needed.

		0		Marks			
Course Code	Course Title	Course Type	Internal Assessment	Semester Exam	Total	L-T-P	Credits
MTCS111PCT	Advanced Algorithm	PC	30	70	100	4-0-0	4
MTCS112PCT	Advanced Computer Architecture	PC	30	70	100	4-0-0	4
MTCS111RMT	Research Methodology & IPR	RMIPR	15	35	50	4-0-0	2
MTCS11XPET	Program Elective-1	PE	30	70	100	4-0-0	4
MTCS12XPET	Program Elective-2	PE	30	70	100	4-0-0	4
PGCS13XGET	Generic Elective-1	AC	30	70	100	4-0-0	4
MTCS160PCP	Lab– I Advanced Algorithm Lab	LAB	50	50	100	0-0-4	2
MTCS16XPEP	Lab – II (Based on Elective-I)	LAB	50	50	100	0-0-4	2
	800	22-0-8	26				

Semester – I

Semester – II

		Gamma	1				
Course Code	Course Title	Type	Internal	Semester	Total	L-T-P	Credits
		51	Assessment	Exam			
MTCS211PCT	Machine Learning	PC	30	70	100	4-0-0	4
MTCS212PCT	Internet of Things	PC	30	70	100	4-0-0	4
MTCS23XPET	Program Elective-3	PE	30	70	100	4-0-0	4
MTCS24XPET	Program Elective-4	PE	30	70	100	4-0-0	4
PGCS23XGET	Generic Elective-2	GE	30	70	100	4-0-0	4
MTCS260PCP	Lab – III-ML Lab	LAB	50	50	100	0-0-4	2
MTCS261PCP	Lab – IV -IoT Lab	LAB	50	50	100	0-0-4	2
MTCS270PCP	Mini Project with	MPS	50	50	100	0-0-4	2
	Seminar*						
	800	20-0-12	26				

*Students are encouraged to go to Industrial Training/Internship for at least 2-3 months during semester break. They need to make a prototype model in the allotted areas on the recommendations of the supervisor.

			Ν				
Course Code	Course Title	Course Type	Internal	Semester	Total	L-T-P	Credits
			Assessment	Exam			
MTCS31XPET	Program Elective -5	PE	30	70	100	4-0-0	4
MTCS370PCP	Dissertation-I	DISS	210	490	700	0-0-20	10
Total						4-0-20	14

Semester – III

Semester – IV

G.,			Ma		Gualita			
Course Code	Course little	Course Type	Internal Assessment	Semester Exam	Total	L-1-P	Credits	
MTCS470PCP	Dissertation-II	DISS	240	560	800	0-0-28	14	
Total						0-0-28	14	

L-T-P stands for number of contact hours as Lecture-Tutorial-Practical in a week.

PROGRAM ELECTIVES (PE) & GENERIC ELECTIVES (GE)

SEMESTER - 1							
Course Code	Course Title	Course Code	Course Title				
Program	n Elective – I	Prog	ram Elective – II				
MTCS111PET	Advanced Network Security	MTCS121PET	Intelligent Systems				
MTCS112PET	Distributed Database	MTCS122PET	Augmented & Virtual Reality				
MTCS113PET	Data Science	MTCS123PET	Soft Computing				
MTCS114PET	Semantics Web	MTCS124PET	Digital Forensics				
Pi	rogram Elective – I Lab	Ge	eneric Elective-1				
Course Code	Course Title	Course Code	Course Title				
MTCS160PEP	Advanced Network Security Lab	PGCS131GET	English for Research Paper Writing				
MTCS161PEP	Distributed Database Lab	PGCS132GET	Disaster Management				
MTCS162PEP	Data Science Lab	PGCS133GET	Sanskrit for Technical Knowledge				
MTCS163PEP	Semantics Web Lab	PGCS134GET	Value Education				
	SEMES	ГER - 2					
	Program Elective – III	P	rogram Elective – IV				
Course Code	Course Title	Course Code	Course Title				
MTCS231PET	Blockchain Technology	MTCS241PET	Advanced Operating System				
MTCS232PET	Compilers for High Performance Computing	MTCS242PET	Digital Image Processing				
MTCS233PET	Distributed Computing	MTCS243PET	Advanced Wireless & Mobile Networks				
MTCS234PET	Natural LanguageProcessing	MTCS244PET	Mobile Applications & Services				
MTCS235PET	Quantum Computing	MTCS245PET	Graphics Processing Unit Computing				
MTCS246PET	Big Data Analytics						
	Generic I	Elective-2					
Course Code	Course Title						
PGCS231GET	Constitution of India						
PGCS232GET	Pedagogy Studies						
PGCS233GET	Stress Management by Yoga						
PGCS234GET	Personality Developmentthrough L	ife Enlightenment S	škills				
	· · · · · · · · · · · · · · · · · · ·						
	SEMEST	Г ER – 3					
	Program E	lective – V					
	Course Code		Course Title				
	MTCS311PET	Deep Learning					
	MTCS312PET	Secure Software	Design & Enterprise Computing				
	MTCS313PET	Wireless Access 7	Technologies				
	MTCS314PET	Data Preparation & Analysis					
	MTCS315PET	Optimization Techniques					

Course Code Cou						se Title				Lecture			
MTCS111	PCT		<u> </u>	Adva	nced A	lgorithr	n		L	Г Р	S	emes	ter: I
Version: 1.2	C a h a ma	of In ad	Date	of Appr	oval: 16	th BoS 17	7-11-2022	-1	3 1				
No. of	Scheme		LING	n			5	cneme o	or Exami	Secre		100	
Deriods	/ Week	$\cdot 4$	л п і я.					Inter	aximum nəl Evəl	uation	•	30	
renous	<u>Credits</u>	· 4						mei	Fnd Ser	nester	•	70	
Instructio	n Mode	· Le	ecture					F	xam Du	ration	•	3 H	rs
Prerequisit		-	main De	lucion	•	0 11	. 5.						
Course Obj	ectives:		0										
1. To learn	n an appr	opriate	strateg	gy to sol	lve a pr	oblem.							
2. To devise algorithms by choosing appropriate d							uctures.						
3. To desi	ign and	analyze	e implei	mentati	on of a	algorithn	ns and da	ata stru	ctures f	for diffe	eren	t kin	ids of
problen	ns.	_		_									
4. To gain	knowled	ge aboi	ut the ir	herent	structu	ire/hard	ness of a	problem	l .				
Course Out	comes (C	CO):			<u>a.</u>								
COs No.					Staten	nent				Maj	ppec	l Pro	gram
	Undong	tond th	Ducou	mmine	Duchlo	m Ctator	monta for	Algorith				nes (POS)
	Unders		e progra	ammin	g Proble	in State	nents for	Algorith	ms.	PC	<i>J</i> 1, P	$D_2, 1$	
CO_2	onders	tand the	e neces	sary ma	unemat	lical abst	raction to	solve			PO	2, PC) 4
CO	Analyze	the Eff	liciency	and Dr	oofs of	Correctr	ess in Alo	orithms			ΦΩ	DC)-
	Compre	hond c	nd sol	and in	orithm	design of	noroache	$\frac{1}{2}$	problem			$\frac{1}{2}$	<u>/3</u> D(
04	specific	manne	r sei	eet algo	51101111	ucsign a	прибаси	lo ili a	problem		ј4, г	09, 1	F U 12
PO 1- Engin	eering K	nowled	lge. PO	2- Prol	olem ai	nalvsis. 1	PO3- Des	ign /dev	elopme	nt of s	olut	ions.	PO ₄ -
Conduct in	vestigatio	ons of c	complex	c proble	ems, PC) 5- Mode	ern tool u	sage, PC) ₆ - The	engine	er ai	nd so	ociety.
PO7- Enviro	nment a	nd sust	ainabili	ty, PO 8	- Ethics	5, PO 9- II	ndividual	or team	work, I	2 0 10- Co	omn	nunic	ation,
PO ₁₁ - Projec	et manag	ement a	and fina	nce, PC) 12- Life	-long Le	arning						
		М	apping	of cour	se outc	omes wi	th progra	m outco	mes				
Course	PO ₁	PO ₂	PO ₃	PO₄	PO ₅	PO ₆	PO ₇	PO ₈	PO	PO ₁₀	Р	011	PO 12
Outcomes							/			10			15
	3	2		3									
		3	2	Z	2								
			2	3	3				2				1
			1_	Deason	ahle: 2 -	- Sianifi	rant: 3 - 9	Strong	2				1
Detailed Co	ntents:		1	Reuson	ubic, 2	Signiju	<i>unt</i> , 5 c	scrong					
Detailed ea	incentes.	Intro	ductio	n to	algorit	hm Gr	owth o	f funct	ions	Master	.'c '	Theo	rem
		Sorti	ng O	nick S	ort F	lean S	ort Sha	i runco ker So	ort ar	d Co	unti	ing	Sort
Unit:	1	Asym	ng. Q	Nota	tion S	Solving	recurre	nce rel	ations	using	sul	nstiti	ution
		meth	od	nota		Joiving	recurre	lice rei	ations	using	Sui	5010	acioni
		Groo	dy Ma	thod	Minim	num Cr	anning	Treo_P	rim's	Algorit	hm	Te	rian'a
		Algor	uy Me	ntrodu	ivilian t	o Dypa	mio proc	rommi	ng pri	aginal	of or	ntim	i jan s
I Init:	о О	Single		ce Sh	ortest	Doth-Be	llmon-F	ord Alo	orithm		oire	Sho	ancy,
Daths Algorithm-Johnson's Algorithm Longost Common Sequence (
		Huffr	nan's c	rođe	011150	ii s Aigo	1 ICIIII, L	ongest	Comm	on see	luci		LCS),
		Strin	a Mote	phing:	Introd	uction	to String	r Matel	ving a	oplicat	ion	ofs	tring
		mate	hing N	Jaiveal	gorith	m Rahin	Karn	algori	thm Kr	ppicat	Moi	rrig_	Dratt
Unit ¹ 3 algorithm Bover-Moore						i itarp	aigori		lutii	IVIO.	115	Trace	
C IIIC.	0	Algor	ithm (Chaine	d Mati	rix Mult	inlication	n Trave	ling S	alesper	son	Pro	blem
		(TSP)		Channe	a mati	in iviult	-pircatio	, 1140	June D	aresper	501	0	510111
		NP-H	lard an	nd NP-	Compl	ete pro	blems: B	asic Co	ncepts.	Non-	Dete	ermi	nistic
Unit:	4	Algor	ithms,	NP ·	-Hard	and 1	NP-Com	olete (Classes,	Cool	k's	theo	orem.
		Rand	omizec	l Algori	ithms								
Unit: 5 Introduction to parallel algorithm. Parallel Algorithm- Ana							naly	sis,					

	models, Parallel Random Access Machines (PRAM), Parallel Algorithm Structure, Parallel Algorithms for Sorting, Searching and Merging
Exa	mination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class
sess	ional exams/assignments/quiz/seminar presentation etc. and external evaluation (70 marks)
whi	ch is mainly end semester examination.
Tex	t Books:
1	Algorithms, Coreman, Rivest, Lisserson, PHI, Third Edition.
2	Design and Analysis of Algorithms, Manas Ranjan Kabat, PHI.
Refe	erence Books:
1	Design and Analysis of Algorithms, R. Panneerselvam, PHI.
2	Parallel Algorithms, Henri Casanova, Arnaud Legrand, Yves Robert, CRC Press.

Course C	ode				Course	Title			Le	ctur	e			
MTCS112	РСТ		Adva	nced C	Comput	er Arch	itecture		L	Т	Р	Se	mest	er: I
Version: 1.2			Date	of Appr	oval: 16	th BoS 1	7-11-2022		3	1	0			
	Scheme	e of In	structio	n			S	cheme o	f Exar	ninat	tion			
No. of	Periods	: 6	60 Hrs.					Ma	aximu	m Sc	ore	:	100	
Periods	/ Week	: 4	<u>l</u>			Internal Evaluation : 30								
Transformed	Credits	: 4	-						End S	emes	ster		2.11	
Instruction	n Mode		Lecture	instian				E	xam L	Jurat	10N	:	3 Hrs	5.
Course Obje	e(s): Con	ipute	r Organ	ization	1									
1 To provide knowledge of the Parallelism concepts in Programming														
2. To provide an elaborate idea about the different memory systems and h										hus	es			
3 To introduce the advanced processor architectures to the students									Dus	scs.				
4. To acquaint the students with the importance of multiprocessor and multicomr										mput	ter.			
Course Out	comes (C	CO):			- I			1		-				
COs No.		,			Stater	nent					Ma	ppeo	l Prog	gram
											Ou	itcoi	nes (F	POs)
CO ₁	Under	stand	l the co	ncept	s of pa	rallel c	ompute	r mode	ls,			PO	1, PO2	2
	pipelir	ie and	d its haz	zards.										
CO ₂	Explain	n the	conce	pts of	paralle	el comp	outing a	nd hare	dwar	e		PO	2, PO	3
	techno	ologie	es.											
CO ₃	Under	stanc	l the co	ncept	and ii	mporta	nce of N	1emory				PO	3, PO	4
	Hierar	<u>chy, </u>	mappin	g tech	nique	s.		~						
CO ₄	Compi	reher	nd Scala	able Ai	rchited	ctures,	Pipelini	ng,Supe	ersca	lar		PO	4, PO	5
DO. Engino	proces	ssors,	$\frac{\text{multip}}{\text{multip}}$	Problem	sors		Docion /d	ovolonmo	nt of	colut	iona	DO	Cor	nduat
investigations	s of comp	lex pro	ge, PO 2- oblems P(Problen D₅- Mod	ern tool	usage. PO 3-	Design/u De- The en	gineer an	nt oi d socie	solut	1011s, O 7- E	nvira	i- Coi nmen	t and
sustainability	, PO 8- Eth	ics, PO	9- Individ	ual or te	am work	, PO 10- CC	mmunicat	ion, PO 11-	Project	t man	agem	ient a	and fin	ance,
PO12- Life-lor	ng Learnir	ig						,	5		0			,
]	Mapping	of cour	se outc	omes wi	th progra	m outco	mes			1		
Course	PO ₁	PO ₂	PO ₃	PO₄	PO ₅	PO ₆	PO ₇	PO ₈	PO	Р	O 10	Р	D 11	PO ₁₂
Outcomes	101	102	103	104	103	100	10/	108	103		010	- `		1012
	3	2								_				
		2	3	-						_				
CO ₃			3	2	0					_				
CO4				2	3	<u> </u>		74						
Detailed Co	ntontai		1-	Reason	able; 2 ·	- Signifi	cant; 3 – S	strong						
Detailed Co	ntents:	Doui	out of D	aria O	raniza	tion and	Anobito	otumol T	ochnid		DIC	0	<u></u>	
		Char	ew OI D	asic Ol	Igailiza	cossors	DISC Vg			jues.	of I	c p netr	uction	sors,
Unit	1	Arch	itectures	cs of Ki	w of n	erforma	nce mea	cisc, cia	ts Ra	sic r	aral	lisu lel r	roces	ssing
Onic.	1	tech	niques. Ii	nstructi	ion leve	l thread	level and	process	level	Class	sifica	tion	of par	rallel
		arch	itectures	l.		,, en caa	iever and	process	10101,	ciuse			orpu	unor
		Instr	uction I	evel Pa	arallelis	m: Basic	concept	s of pip	elining	g, Ar	ithm	etic	pipel	ines,
		Instr	uction p	ipelines	s, Hazaı	ds in a j	pipeline: s	structura	l, data	i, and	d cor	ntro	, Haz	ards,
Unit:	2	Over	view of l	nazard :	resoluti	on techr	niques, Dy	namic ir	nstruc	tion a	sche	duliı	ng, Bra	anch
		pred	iction te	echniqu	es, Ins	truction	-level pai	rallelism	using	sof	twar	e ap	proad	ches,
		Supe	erscalar t	echniqu	ies, Spe	eculative	execution	n.						
		Men	nory Hie	rarchie	s: Basic	concep	ot of hier	archical	mem	ory o	orgai	nizat	tion, 1	Main
Unit:	3	memories, Cache design and implementation, Virtual memory design and												
		impl	Implementation, Secondary technology.											
		Thre	Thread Level Parallelism: Centralized vs. distributed shared memory,											
Unit:	4	Inter	connect	ion	topolog	gies,	Multiproc	essor	arch	itect	ure,	C L	symm	etric
		mult	iprocess	ors, Cao	che coh	erence p	problem, S	synchron	izatio	n, Me	emor	у со	nsiste	ency,
		Mult	icore arc		re, Kev	iew of m	oaern mu	ntiproces	SSOTS.	torr	C.	4	Actor C	
Unit:	5	Proc	ess Lev	el Para	ulelism:	Distrib	utea cor	nputers,	Clus	uers,	Gri	a, f	viainfr	rame
		com	puters. I	rempnei	a Dev	ices: Bus	structur	es and s	standa	rus,	sync	.111'0	nous	and

		asynchronous buses, Types and uses of storage devices, Interfacing I/O to the rest
		of the system, Reliability and availability, I/O system design, Platform architecture.
Exa	mination and Ev	raluation Pattern: It include both internal evaluation (30 marks) comprising two class
sess	ional exams/ as	signments/quiz/seminar presentation etc. and external evaluation (70 marks) which
is m	ainly end semes	ter examination.
Tex	t Books:	
1	Hennessey and	l Patterson," Computer Architecture: A quantitative Approach", Morgan Kaufman.
2	Kai Hwang, Fa	ye A. Briggs, "Computer Architecture and Parallel Processing "McGraw-Hill
	international E	dition.
Refe	erence Books:	
1	KaiHwang,"Ac	lvanced Computer Architecture", Tata McGraw-Hill
2	El-Rewini, H.,	& Abd-El-Barr, M.(2005).Advanced computer architecture and parallel
	processing (Vo	al 42) John Wiley & Sons

Course Co	ode			(Course	Title			Lec	ture			
MTCS111R	MT		Res	earch	Method	lology a	nd IPR		L	Т Р	S	emes	ter: I
Version: 1.2			Date of	of Appr	oval: 16	th BoS 17	7-11-2022		3	1 0			
	Scheme	of Iı	nstructior	ı			S	cheme o	f Exam	ination			
No. of P	eriods	:	30 Hrs.					Ma	aximun	n Score	:	50	
Periods/	Week	:	4					Interi	nal Eva	luation	:	15	
	Credits	:	2]	End Se	mester	:	35	
Instruction	Mode	:	Lecture					E	xam Di	uration	:	2 Hi	rs.
Prerequisite	(s): No s	peci	fic prerequ	uisite									
Course Object	ctives:												
1. To under	rstand r	esear	ch proble	m and s	scientifi	c approa	iches app	lied for t	he sam	e			
2. To design	n experi	men	ts and to a	inalyze	results	of the ex	periment	S					
3. To prepa	To prepare technical reports and research papers												
4. To under	To understand the need of IPR to be promoted among students in general & engineering in particular.									cular.			
Course Outc	omes (C	:0):			<u> </u>					1.16		1.0	
COs No. Statement									Ma	ippe	d Pro	ogram	
	T11 4	1		1 1 .		1		1	1.1			mes (POs)
	Illustra	te th	ie researc	ch obje	ctives	and con	struct re	search p	proble	m P	U1, I	$PO_2, 1$	PO ₉ ,
	scienti	icall	y .							1 -			
CO ₂	Apply t	he sy	ystematic	e appro	bach to	achieve	research	h object	ives ar	nd P	${\bf J}_{4,}$	PO ₈ ,	PO ₉
	analyse	es re	sults										
CO ₃	Explain	the	e self-wri	tten r	esearcl	n paper	s and de	efend in	ı revie	W P	$0_4, 1$	PO6,	PO ₁₂
	commi	ttee											
CO ₄	Develo	p Re	ports and	l files							PO	6, PC) ₁₂
PO1- Engineer	ring Kno	owled	lge, PO 2-	Problem	analys	is, PO 3-	Design/de	evelopmei	nt of s	olutions	, PC	4- Co	onduct
investigations	of comp	lex pr	roblems, PC	D ₅ - Mod	ern tool	usage, PC	6 - The eng	gineer and	d societ	y, PO ₇ - 1	Envir	onme	nt and
sustainability,	PO8- Eth	ics, P	U 9- Individi	ial or tea	am work	, PO 10- CO	mmunicati	on, PO 11-	Project	manager	nent	and fi	nance,
PO12- LITE-IOTIS	g Lear IIII	g	Manning	of cour	se outc	omes wi	h progra	moutcor	nes				
Course			inapping	or cour	Se oute		in progra	iii outeoi		_		_	
Outcomes	PO ₁	РО	2 PO ₃	PO_4	PO ₅	PO_6	PO_7	PO ₈	PO ₉	PO ₁₀	P	O ₁₁	PO ₁₂
CO ₁	1	2				2			3				
CO ₂				2				3	2				
CO ₃				3		2							3
CO ₄						3							3
			1 -	Reason	able; 2 -	- Signific	cant; 3 – S	strong		•			
Detailed Con	tents:						·	0					
		Res	earch Pro	blem 8	k Resea	rch Desi	gn: Mean	ing of R	lesearc	h, Type	es of	Rese	earch,
		Res	earch Pro	cess, So	ources o	of Resear	ch Proble	m, Chara	cterist	ics of a	Goo	d Res	earch
Unit: 1		Pro	blem, Erro	ors in S	electing	g a Resea	rch Probl	em, Obje	ctives	and Sco	pe c	of Res	earch
		Pro	blem, App	roache	s of Inv	estigatio	n of Solu	tions for	Resear	rch Pro	blem	ı, Res	earch
		Des	sign, Differ	ent Re	search l	Designs.							
		Dat	a Analysis	and S	tatistic	al Techn	iques: Qu	ıantitativ	ve Met	hods ai	nd T	echn	iques,
Unit: 2		San	npling Des	sign, Di	fferent	Types of	fSample	Designs,	Metho	ods of D	ata	Colle	ction,
		Mea	asures of (Central	Tender	icy, Mea	sures of V	ariation,	Measu	res of F	lelat	ionsh	ip.
		Fre	quency D	istribu	tion, Id	entifying	g the Dis	stributio	n with	Data,	Cei	ntral	Limit
Unit: 3		The	eorem, Par	ameter	· Estima	ition, Ch	i-Square '	Test, Coi	rrelatic	on Analy	vsis,	Regre	ession
		Ana	ilysis, Tim	e Series	s and Fo	recastin	g, hypoth	esis Test	ing.	m 1	•	1 1.7	
		Wr	iting Repo	ort, Dis	sertatio	n and R	esearch I	Papers: I	Effectiv	e Tech	nıca	I Wi	riting,
Unit: 4		Dev	eloping a	Resear	rch Pro	posal, Fo	ormat of	Research	1 Prop	osal, Pr	esen	tatio	n and
		ASS	essment t	y Kevi	ew con	annittee,	Gulaelin	es for W	ing	une Re	port	, kes	earch
		Рар	er, Under	standin	g Keler	$\frac{1000}{100}$	Itations al	Conversion	nig.	adama	lrc	Dros	ag cf
Unit: F		Dot	enting and	nopert	y rights	s (IPK): Intorne	ratents,	Copyrigi	Its, IT		KS, durc	for	ranta
Unit: 5		rati	ciulig alle	tonting	sundor	, mierna DCT	uonai COO	peration	OUTER	, Proce	Jure	101.0	manus
		ULF	atents, Pa	renting	g under	rUI.							

Exar sess	mination and Evaluation Pattern: It include both internal evaluation (15 marks) comprising two class ional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (35 marks) which
is m	ainly end semester examination.
Text	t Books:
1	Vinayak Bairagi, Mousami V. Munot, Research Methodology: A Practical and Scientific Approach, CRC
	Press, 2019
2	C.R. Kothari and Gaurav Garg, "Research Methodology: Methods and Techniques", 4th ed., New Age,
	International Publishers, 2019
Refe	erence Books:
1	Ranjit Kumar, "Research Methodology: A Step by Step Guide for beginners"4th ed., SAGE
	Publications, 2014
2	Debora J. Halbert, "Resisting Intellectual Property", Routledge, 2006.

Course (Code			(Course	Title			Lee	cture				
MTCS16	0PCP			Advanc	ed Alg	lgorithm Lab L					Р	Se	emes	ter: I
Version: 1.2	2		Date	of Appr	oval: 16	th BoS 17	7-11-2022		0	0	4			
	Scheme	e of Ins	truction	n			S	cheme o	f Exan	inati	on			
No. of	Periods	: 6	0 Hrs.					Ma	aximur	n Sco	re	:	100	
Periods	/ Week	: 4						Inter	nal Eva	luatio	on	:	50	
	Credits	: 2							End Se	mest	er	:	50	
Instructio	on Mode	: P	ractical					E	xam D	uratio	on	:	3 H	rs.
Prerequisit	te(s): Algo	orithm	Design											
Lourse Obj	ectives:	progr	mming	skill an	dimpro	we the n	rogrammi	nglogic						
2. To unde	erstand t	he con	plexity	of algor	ithms.	we the pi	ogrammi	ng logic.						
3. To deve	elop skills	to app	ly appro	opriate	data str	uctures	and algori	thms in	proble	m sol	ving	ŗ		
4. To Des	ign and	and analyze implementations of algorithms and data structures for different kinds of												
problem	ns.													
Course Out	tcomes (C	CO):												
COs No.					Stater	nent					Maj	ppeo	d Pro	ogram
		1 5				G + - +			. 1		Ou	tcoi	mes ((POs)
CO ₁	Apply 1	he Pr	ogrami	ning P	roblen	n Stater	nents fo	r Algori	thms.		PC	J ₁ , I	PO_2 ,	PO_4
CO ₂	Apply	the	necess	sary n	nather	natical	abstrac	tion to	o sol	ve		PO	2, P	\mathbf{D}_4
	proble	ms.		5										
CO ₃	Analyz	e th	e Effic	ciency	and	Proof	s of C	orrectr	ness	in		PO	3, P (\mathbf{D}_5
	Algorit	hms												
CO ₄	Demoi	nstrat	e algo	rithm	desig	n appr	oaches	in a p	oroble	m	PC)4, F	PO 9,	PO ₁₂
	specifi	cmar	ner.											
PO1- Engin	eering K	inowle	dge, PC	2- Prol	olem ai	nalysis, l	PO₃- Des	ign/dev	elopme	ent o	fso	oluti	ons,	PO ₄ -
	luct investigations of complex problems, PO_5 - Modern tool usage, PO_6 - The engineer and society,													
Conduct in	vestigatio	$_{7}$ - Environment and sustainability. PO ₈ - Ethics PO ₆ - Individual or team work PO ₆ - Communication												
Conduct in PO ₇ - Enviro	onment a	nd sus	complex tainabili	ty, PO 8	ems, PC - Ethics) 5- Mode 5, PO 9- I1	ern tool u ndividual	sage, PO or team	work,	PO ₁₀ -	- Co	omm	iu sc iunic	cation,
Conduct in PO ₇ - Enviro PO ₁₁ - Projec	onment a	nd sus	tainabili and fina	ty, PO 8	ems, PC - Ethics D ₁₂ - Life	0 ₅- Mode s, PO 9- In -long Les	ern tool u ndividual arning	sage, PC or team	work,	PO ₁₀ -	- Co	omm	iunic	cation,
Conduct in PO ₇ - Enviro PO ₁₁ - Projec	onment a	nd sus ement	complex tainabili and fina lapping	ty, PO 8 nce, PC of cour	ems, PC - Ethics D ₁₂ - Life se outc	9 ₅- Mode s, PO 9- In <u>-long Le</u> s omes wi	ern tool u ndividual arning th progra	sage, PC or team m outco	work,	PO ₁₀ -	- Co	omm		cation,
Conduct in PO ₇ - Enviro PO ₁₁ - Projec	vestigation onment a ct manag	nd sus ement N PO2	tainabili and fina Apping	ty, PO ⁸ nce, PC of cour	ems, PC - Ethics D ₁₂ - Life se outc PO ₅	D_5 - Mode s, PO_9 - In -long Lea omes wi PO_6	ern tool u ndividual arning th progra PO 7	or team m outcor	mes	PO ₁₀ -	- Co		ounic	PO ₁₂
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes	PO1	nd sus ement N PO ₂	tainabili and fina fapping PO ₃	ty, PO ₈ nce, PO of cour PO ₄	ems, PC - Ethics D ₁₂ - Life se outc PO ₅	D 5- Mode s, PO 9- In -long Lea omes wi PO 6	ern tool u ndividual arning th progra PO 7	or team m outcor PO ₈	mes	PO ₁₀ -	- Co	er al omm P(unic	PO ₁₂
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁	PO1	nd sus ement PO ₂ 2	tainabili and fina fapping PO3	$\frac{proble}{ty, PO_8}$ $\frac{nce, PC}{of cour}$ $\frac{PO_4}{3}$	ems, PC - Ethics D ₁₂ - Life se outc PO ₅	D 5- Mode s, PO 9- In -long Le. omes wi PO 6	ern tool u ndividual arning th progra PO 7	sage, PC or team m outcon PO ₈	mes	PO ₁₀ -	010	P(ounic	PO ₁₂
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂	PO1	nd sus ement PO ₂ 2 3	complex tainabili and fina (apping PO ₃	Problem ty, PO ₈ nce, PC of cour PO ₄ 3 2	ems, PC - Ethics D ₁₂ - Life se outc PO ₅	D ₅ - Mode s, PO ₉ - In -long Le omes wi PO ₆	ern tool u ndividual arning th progra PO ₇	m outcom PO ₈	mes	PO ₁₀ -)10		D ₁₁	PO ₁₂
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃	PO1	PO ₂	complex tainabili and fina (apping PO ₃	PO_4	ems, PC - Ethics D ₁₂ - Life se outc PO₅ 3	D₅- Mode s, PO₃- In -long Le. omes wi PO₅	rn tool u ndividual arning th progra PO ₇	r team m outcon PO ₈	PO ₉	PO ₁₀ -	- Co	P(D ₁₁	PO ₁₂
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄	PO1	PO ₂	complex tainabili and fina (apping PO ₃ 2	Problem ty, PO ₈ nce, PC of cour PO ₄ 3 2 3 Reason	ems, PC - Ethics D ₁₂ - Life se outc PO ₅ 3 able: 2	D5- Mode s, PO9- In -long Le. omes wi PO6	rn tool u ndividual arning th progra PO7	ream outcom PO ₈	PO ₉	PO10-	- Co		D ₁₁	PO ₁₂
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄	PO1 3 PO1 3	PO ₂	compley tainabili and fina (apping PO ₃ 2 2 1 –	PO ₄ 3 Reason	ems, PC - Ethics D_{12} - Life se outc PO_5 3 able; 2 -	D5- Mode s, PO9- In -long Le: omes wi PO6 - Signific	rn tool u ndividual arning th progra PO7 PO7	ream moutcon POs Strong	PO ₉	PO10-)10	P(PO ₁₂
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co	PO1 3 ontents:	PO2 2 3	read fination for the set of read of the set of the set of read of the set o	PO ₄ 3 Reason	ems, PC - Ethics D_{12} - Life se outc PO_5 3 able; 2 ·	D5- Mode s, PO9- In -long Le. omes wi PO6 - Signific	ern tool u ndividual arning th program PO7 cant; 3 – S	sage, PC or team m outcom POs Strong	PO ₉	PO10-	- Cc		D ₁₁	PO ₁₂
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co i.	PO1 3 ontents: Sort a comple	PO2 given xity. R	complex tainabili and fina (apping PO ₃ PO ₃ 2 2 1 – 1 – set of r	PO ₄ 3 2 Reason integer	ems, PC - Ethics D ₂ - Life se outc PO ₅ 3 able; 2 - er elem for var	D5- Mode s, PO9- In -long Le. omes wi PO6 - Signific ents usi: ied value	rn tool u ndividual arning th program PO7 cant; 3 – S cant; 3 – S	sage, PC or team m outcom PO ₈ Strong Sort mo 000 and	PO ₉	PO10-	- Cc	P(D ₁₁ e its	PO ₁₂
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co i.	PO1 3 ontents: Sort a comple Plot a g	PO2 2 3 given xity. R raph o	recomplex tainabili and fina (apping PO ₃ PO ₃ 2 2 1 - set of r un the p f the tin	PO ₄ a pof cour PO ₄ a Reason n integer rogram ne taker	ems, PC - Ethics D_{12} - Life se outc PO_5 able; 2 er elem for varia	D5- Mode s, PO 9- In -long Le. omes wi PO 6 - Signifi ents usini ied value s n on gra	rn tool u ndividual arning th program PO 7 Cant; 3 – S ng Quick s of n > 50 aph sheet	sage, PC or team m outcom PO ₈ Strong Sort mo 000 and . The ele	PO ₉ PO ₉ 2 ethod record ments	PO10-	Com	P(D ₁₁ e its en to	PO ₁₂ PO ₁₂
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co i.	PO1 3 ontents: Sort a comple Plot a g or car	PO2 2 3 given xity. R raph o	read complex tainabili and fina fina fina fina fina fina fina fina	PO ₄ a b b b c c c c c c c c c c c c c c c c	ems, PC - Ethics D_{12} - Life se outc PO_5 able; 2 er elem for vari- n versus ing the	D5- Mode s, PO9- In -long Le. omes wi PO6 - Signific ents usi- ied value s n on gra e rando	rn tool u ndividual arning th progra PO7 PO7 cant; 3 – S cant; 3 – S ng Quick s of n > 50 aph sheet	sage, PC or team m outcom PO ₈ Strong Sort me 000 and . The ele per gen	PO ₉ PO ₉ 2 ethod record ments erator	PO10- PC	Dio	P(e itssen to	PO ₁₂ PO ₁₂
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co i.	PO1 3 ontents: Sort a comple Plot a g or car C/C++,	PO2 2 3 given xity. R raph o be /Java/	read provide the set of read of the set of	PO ₄ 3 2 3 Reason n integer rogram ne taker ied usi how tl	ems, PC - Ethics D_{12} - Life se outc PO_5 able; 2 er elem for vari- n versus ing the he divide	D5- Mode s, PO 9- In -long Lea omes with PO6 - Signific ents using ied value s n on gra- te rando de and-	rn tool u ndividual arning th progra PO7 PO7 cant; 3 – S cant; 3 – S cant; 3 – S cant; a – S	sage, PC or team m outcon PO ₈ Strong Sort me 000 and . The ele per gen method	PO ₉ PO ₉ 2 ethod record ments erator works	PO10- PC	D ₁₀	P(D ₁₁ e its from ate 1 its	PO ₁₂ PO ₁₂ 1 s time o sort. n a file using time
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co i.	PO1 PO1 3 DINTENTS: Sort a comple Plot a g or car C/C++, comple	PO2 2 3 given xity. R raph o be /Java/ xity an	PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3	PO ₄ 3 2 3 Reason n integer rogram ne taker ked usi how the	ems, PC - Ethics D ₁₂ - Life se outc PO ₅ 3 able; 2 er elem for varia r versus ing the ne divise, aver	D5- Mode s, PO 9- In -long Lea omes wi PO 6 - Signific ents using ied value s n on gra- te rando de and- rage case	rn tool u ndividual arning th progra PO7 PO7 cant; 3 – S ng Quick s of n > 50 aph sheet om numb conquer and best	sage, PC or team m outcom POs Strong Sort me D00 and . The ele per gen method case.	PO ₉ PO ₉ 2 ethod record ments erator works	PO10- PC	com ime	P(pnput e tak ead nstra with	D ₁₁ e its en to from ate 1 its	PO ₁₂ PO ₁₂ 1 s time o sort. a file using time
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co i.	PO1 PO1 3 PO1 Sort a comple Plot a g or car C/C++, comple Write t	PO2 2 3 given xity. R rapho be /Java/ xity an he Pro	PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3	PO ₄ 3 2 3 Reason n integer rogram te taker how the vorst ca implem	ems, PC_{ems} , PC_{s} - Ethics D_{12} - Life se outc PO_{5} BO	D5- Mode s, PO9- In -long Le. omes wi PO6 - Signifu ents usi ied value s n on gra e rando de and- age case followin	rn tool u ndividual arning th program PO7 PO7 cant; 3 – S cant; 3 – S cant; 3 – S cant sheet om numb conquer and best g Sorting	sage, PC or team moutcom POs Sort mo Sort mo D00 and . The ele per gen method case. Algorith	PO9 PO9 2 ethod record ments erator works ms:	PO10- PC	com	P(D ₁₁ e its en to from ate 1 its	PO ₁₂ 1 5 time 5 sort. 1 a file 1 using time
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co i.	PO1 3 ontents: Sort a comple Plot a g or car C/C++, comple Write t a) Hea	PO2 2 3 given xity. R raph o be /Java/ xity an he Pro ap Sor	recomplex tainabili and fina (apping PO ₃ PO ₃ 2 2 1 - set of r un the p f the tim generat Python alysis: w gram to	PO ₄ 3 2 3 Reason n integer rogram ne taker kow tl vorst ca implem	ems, PC - Ethics D_{12} - Life se outc PO_5 BO_5 able; 2 er elem for vari- a versus ing the ne divises, aver ent the	D5- Mode s, PO9- In -long Le. omes wi PO6 - Signific ents using ied value s n on gra- te rando de and- rage case following	rn tool u ndividual arning th program PO7 PO7 cant; 3 – S cant; 3 – S ng Quick s of n > 50 aph sheet om numb conquer and best g Sorting	sage, PC or team m outcom PO ₈ Strong Sort me D00 and . The ele ber gen method case. Algorith	PO9 PO9 2 ethod record ments erator work:	and of the the second s	com com ime cor mon ng	P(P(e tak ead nstra with	P ₁₁ e its from ate n its	PO ₁₂ 1 3 time 5 sort. 6 a file using time
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co i.	PO1 3 Dontents: Sort a comple Plot a g or car C/C++, comple Write ti a) He. b) Sha	PO2 2 3 given xity. R raph o be /Java/ xity an he Pro ap Sor aker So	rt	A problet ty, PO ₈ nce, PC of cour PO ₄ 3 2 3 Reason a intege rogram be taken ted usi how the vorst ca implem	ems, PC - Ethics D_{12} - Life se outc PO_5 able; 2 able; 2 er elem for vari- n versus ing the he divises, aver ent the	 D₅- Mode PO₉- In -long Lee omes with PO₆ PO₆ Signifid ents using en	rn tool u ndividual arning th progra PO7 PO7 cant; 3 – S cant; 3 – S aph sheet om numb conquer and best g Sorting	sage, PC or team m outcom PO ₈ Strong Sort me 000 and . The ele ber gen method case. Algorith	PO9 PO9 2 ethod record ments erator works ms:	and of the t can be alor	com com ime	P(P(e tak ead nstra with	e its e its en to from ate	PO ₁₂ 1 3 time 5 sort. 6 a file using time
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co i.	PO1 PO1 3 PO1 3 Ontents: Sort a comple Plot a g or car C/C++, comple Write ti a) Hea b) Sha c) Cor	PO2 PO2 2 3 given xity. R raph o be /Java/ xity an he Pro ap Sor ker So unting	rt Sort	PO₄ 3 2 3 Reason n intege rogram ne taker ied usi how th orst ca implem	ems, PC - Ethics D_{12} - Life se outc PO_5 able; 2 - er elem for vari- n versus ing the he divi- se, aver ent the	 D₅- Mode PO₉- In -long Lea omes with PO₆ PO₆ Signific ents usinate ents usinate an on grade and and a construction of the second s	rn tool u ndividual arning th progra PO7 PO7 cant; 3 – S cant; 4 –	sage, PC or team m outcom PO ₈ Gtrong Sort me D00 and . The ele per gen method case. Algorith	PO9 PO9 2 ethod record ments erator works ms:	and o the t can t be alor	com imecon plu	P(P(pput e tak ead nstra with	D ₁₁ e its entc from ate 1 its	PO ₁₂ PO ₁₂ 1
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co i. ii.	PO1 PO1 3 PO1 3 PO1 Sort a comple Plot a g or car C/C++, comple Write tt a) He. b) Sha c) Cot	PO2 2 3 given xity. R raph o be /Java/ xity an he Pro ap Sor aker So unting he pro	PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3	a problet ty, PO ₈ nce, PC of cour PO ₄ 3 2 3 Reason a integer rogram ne taker rogram ne taker implem	ems, PC - Ethics D_{12} - Life se outc PO_5 able; 2- er elem for vari- a versus ing than the divi- se, aver ent the ent the	D5- Mode s, PO 9- In -long Lea omes with PO 6 PO 6 - Signific ents using ied value s n on grave the rando de and- rage case following Minimu	rn tool u ndividual arning th progra PO7 PO7 cant; 3 – S cant; 4 –	sage, PC or team m outcom PO ₈ Strong Sort me D00 and . The eleo ber gen method case. Algorith	PO ₉ PO ₉ 2 ethod record ments erator works ms:	PO10- PC	Dio	P(P(put e tak ead nstra with	D ₁₁ e its en to from ate n its	PO ₁₂ PO ₁₂ 1 s time o sort. a file using time
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co i. ii.	PO1 PO1 3 PO1 3 PO1 3 PO1 3 PO1 Sort a comple Plot a g or car C/C++, comple Write tl a) He. b) Sha c) Cot Write tl a) PO1	PO2 PO2 2 3 given xity. R raph o be /Java/ xity an he Pro ap Sor aker So unting he pro m's Alg	recomplexition to the time of	a problet ty, PO ₈ nce, PC of cour PO ₄ 3 2 3 Reason a integer rogram ne taker rogram ne taker sed usi how th vorst ca implem	ems, PC_{r} - Ethics D_{12} - Life se outc PO_5 able; 2 er elem for variant for variant for variant for variant for variant ent the ent the	D5- Mode s, PO 9- In -long Lea omes wi PO 6 PO 6 - Signific ents usinitied value s n on gra- te rando de and- rage case followin Minimu	rn tool u ndividual arning th progra PO7 PO7 cant; 3 – S aph sheet om numb conquer and best g Sorting m Spannin	sage, PC or team m outcom PO ₈ Strong Sort me D00 and . The ele ber gen method case. Algorith	PO ₉ PO ₉ 2 ethod record ments erator work:	PO10- PC	Dio	P(D ₁₁ e its en to from ate 1 its	PO ₁₂ PO ₁₂
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co i. ii.	PO1 3 PO1 3 PO1 3 PO1 3 PO1 3 COT PO1 Sort a comple Plot a g or car C/C++, comple Write ti a) He: b) Sha c) Cou Write ti a) PO1 Urite ti b) Tan	PO2 2 3 given xity. R raph o be /Java/ xity an he Pro ap Sor ker So unting he pro m's Alg jan's A	recomplexities the second seco	A problet ty, PO ₈ <u>nce</u> , PC of cour PO ₄ 3 2 3 Reason n integer rogram ne taker rogram ne taker implem n n	ems, PC - Ethics D_{12} - Life se outc PO_5 able; 2 able; 2 er elem for vari- n versus ing the ne divises, aver ent the ent the	D5- Mode s, PO ₉ - In -long Le. omes wi PO ₆ - Signific ents usi- ied value s n on gra- te rando de and- rage case followin Minimu	rn tool u ndividual arning th progra PO7 PO7 cant; 3 – S ng Quick s of n > 50 aph sheet om numb conquer and best g Sorting m Spannir	sage, PC or team m outcom PO ₈ Sort mo Sort mo DOO and . The ele ber gen method case. Algorith	ethod record ments erator ms:	and of the t can be so alor	com	P(Pıı e its	PO ₁₂ 1 s time o sort. n a file using time
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co i. iii.	PO1 3 PO1 3 PO1 3 PO1 3 PO1 3 COT PO1 Sort a comple Plot a g or car C/C++, comple Write tt a) He b) Sha c) Cor Write tt a) PO1 Tar Write a Write a Write a	PO2 2 3 given xity. R raph o be /Java/ xity an he Pro ap Sor ker So unting he pro m's Alg jan's A progra	rt Sort gram to complex tainabili and fina fina fina fina fina fina fina fina	implement	ems, PC_{r} - Ethics D_{12} - Life se outcome PO_5 able; 2 - able; 2 - er elem for variant r elem for variant se, aver ent the ent the but the B	D5- Mode s, PO3- In -long Le. omes wir PO6 - Signific ents usi- ied value s n on gra- te rando de and- age case followin Minimu ellman-F SP probl	rn tool u ndividual arning th progra PO7 PO7 cant; 3 – S cant; 3 – S aph sheet om numb conquer and best g Sorting m Spannin	sage, PC or team moutcon PO ₈ Strong Sort me 000 and . The ele ber gen method case. Algorith ng Tree: ithm	PO9 PO9 2 ethod record ments erator works ms:	and o the t can t s alor	Dio	P(P(e tak ead nstra with	e its e its en to from ate	PO ₁₂ PO ₁₂ 1
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Cc i. ii. ii. v. v. v.	PO1 PO1 3 PO1 3 PO1 3 PO1 3 PO1 3 PO1 3 PO1 3 PO1 3 PO1 3 PO1 3 PO1 3 PO1 3 PO1 3 PO1 Sort a comple Plot a g or car C/C++, comple Write ti a) Hea b) Sha c) Cou Write ti a) PO1 PO1 Plot a g or car C/C++, comple Plot a g or car C/C++, comple Plot a g or car C/C++, comple Write ti a) Hea b) Sha c) Cou Write ti a) PO1 Plot a g or car C/C++, comple Plot a g or car C/C++, comple Plot a g or car C/C++, comple Write ti a) Hea b) Sha c) Cou Write ti a) Pri b) Tar Write a Write a Write a C/C++	PO2 PO2 2 3 given xity. R raph o be /Java/ xity an he Pro ap Sor ap Sor an Sor ap Sor an Sor ap Sor an Sor ap Sor ap Sor an Sor	rt Sort gram to corithm algorithm am to im am to im corit	implement problement provide the second s	ems, PC_{-} Ethics - Ethics D_{12} - Life se outc PO_5 able; 2 - er elem for variance for variance in versus ing the he divises, aver ent the ent the bit the B that the The pot the T	D5- Mode s, PO9- In -long Lee omes wir PO6 - Signific ents usir ied value s n on gra e rando de and- age case followin Minimu ellman-F SP proble Longest	rn tool u ndividual arning th progra PO7 PO7 cant; 3 – S ng Quick s of n > 50 aph sheet om numb conquer and best g Sorting m Spannis	sage, PC or team moutcon PO ₈ Strong Sort me D00 and . The ele ber gen method case. Algorith ng Tree: ithm	PO9 PO9 2 ethod record ments erator work: ms:	and of the t can the s alor	Dio	P(P(etak ead nstra with	Dıı contraction de la secondación de la secondac	PO12 PO12 1
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co i. ii. iii. iv. v. v. v. v.	PO1 PO1 PO1 3 PO1 Sort a comple Plot a g or car C/C++, comple Write ti a) Hea b) Sha c) Con Write ti a) Prii b) Tan Write a Write a Write a Write a Write a	PO2 PO2 2 3 given xity. R raph o be /Java/ xity an he Pro ap Sor aker So unting he pro gin's Alg jan's Alg jan's Alg progra	rt set of r and sina and fina and fina	implement implement	ems, PC - Ethics D_{12} - Life se outc PO_5 able; 2 - able; 2 - er elem for var: a versus ing the ent the ent the ent the B at the T ent the B	D5- Mode s, PO9- In -long Lea omes wir PO6 - Signific ents usinitied value s n on gra- tied value s n on gra- t	rn tool u ndividual arning th progra PO7 PO7 cant; 3 – S cant; 3 – S cond sheet of n > 50 aph sheet of n numb conquer and best g Sorting m Spannin Cord Algor em. Commor Matching	sage, PC or team moutcon PO ₈ Strong Sort mo 000 and . The ele ber gen method case. Algorith ng Tree: ithm	PO ₉ PO ₉ 2 ethod record ments erator works ms:	PO10- PC and o the t can t can t s alor	robl	P(P(pput e tak ead nstr: with	D ₁₁ e its e its en to from ate n its	PO ₁₂ PO ₁₂ 1 s time o sort. n a file using time
Conduct in PO ₇ - Enviro PO ₁₁ - Projec Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co i. ii. iii. iv. v. v. v. vi.	PO1 PO1 3 PO1 3 PO1 3 PO1 3 PO1 Sort a comple Plot a g or car C/C++/ comple Write ti a) He. b) Sha c) Con Write ti a) Pri: b) Tar Write a Write a	PO2 PO2 2 3 given xity. R raph o be /Java/ xity an he Pro ap Sor aker So unting he pro gina's Alg jan's Alg jan's Alg progra	recomplexitions in a set of recomplexition of the time of time of the time of	implement ty, POs of cour POs 3 2 3 Reason integer orogram taker cogram integer orogram integer orogram integer orost ca implement the following the followi	ems, PC_{r} - Ethics D_{12} - Life se outc PO_5 able; 2 - er elem for vari- a versus ing than e divises, aver ent the ent the bit the B at the T ent the llowing	D5- Mode s, PO9- In -long Lea omes wi PO6 - Signific ents usinitied value s n on gra- te rando de and- rage case followin Minimu ellman-F SP proble Longest Pattern	rn tool u ndividual arning th progra PO7 PO7 cant; 3 – S aph sheet om numb conquer and best g Sorting m Spannin ford Algor em. Commor Matching	sage, PC or team m outcom PO ₈ Strong Sort me D00 and . The ele ber gen method case. Algorith ng Tree: ithm	PO ₉ PO ₉ 2 ethod record ments erator work: ms:	PO10- PC and o the t can b s alor	Dio	em.	D ₁₁ e its en to from ate 1 its	PO ₁₂ PO ₁₂ 1 s time o sort. a file using time

	c) Knuth Morris-Pratt algorithm
	d) Boyer-Moore Algorithm
Exa	mination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class
sess	ional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks)
whie	ch is mainly end semester examination.
Text	t Books:
1	The Algorithm Design Manual by Steve S. Skiena, Springer.
2	https://ds1-iiith.vlabs.ac.in/data-structures-1/ https://ds2-iiith.vlabs.ac.in/data-
	structures-2/
Refe	erence Books:
1	Algorithms: Design and Analysis, Harsh Bhasin, Oxford Publication.
2	The Design and Analysis of Algorithms, Annay Levitin, Pearson.

Course C	Course Code Cou					e Title				cture			
MTCS2111	РСТ			Мас	hine Le	earning			L	Т	P S	eme	ster: II
Version: 1.2			Date of	of Appro	oval: 161	<u>th BoS 17</u>	-11-2022		4	0	0		
	Scheme	of Instr	uction				Sc	heme o	f Exan	ninatio	n	10	
No. of	Periods	: 60	Hrs.					Ma	ximun	1 Score		10	00
Periods	/ week	$\begin{array}{c} : 4 \\ \cdot & 4 \end{array}$				End Semester · 70))
Instructio	n Mode	· 4	cture					Ex	am Di	iration		3	, Hrs
Prerequisite	s): Know	ledge c	of basic	data s	cience	algorith	nms	L12		aration			1115.
Course Object	tives:												
1. To learn a	bout the	purpos	e of Ma	chine L	earning	g and wh	ere it app	lies to t	he rea	l world	ls.		
2. To unders	stand a ra	inge of	machin	e learni	ng algo	rithms a	long with	their st	rengtl	ns and	wea	knes	ses.
3. To learn methodology and tools to apply machine learning algorithms.													
4. To real da	ta and ev	valuate	their pe	erforma	nce.								
Course Outco	mes (CO):			~								
COs No.					Statem	ent				M	appe	ed Pr	ogram
CO	Undorg	tand th	- impor	tanco o	f data r	ro-proo	occingho	foro mo	ohino			DO:	(POs)
	learning	anu un v model	ing	tance o	n uata p	ne-proc	essing be	iore ma	chine	P	$\mathbf{U}_{1},$	PU ₂	, PO5
CO ₂	Ability t	o form	ilate m	achine	earning	y technio	ues to re	spective	د د	Р	02	PO ₄	PO ₅
002	problen	ns.		uennie i	cuimie	, teening		spectre	-	1	02,	104	, 103
CO ₃	Perform	nance a	nd evalu	uation o	of learni	ng algor	ithms and	l model			PO	D 1, P	O 5
	selectio	n.				0 0						-	
CO ₄	Apply n	nachine	learnin	g algori	ithms to	o solve p	roblems o	of variou	IS	P	PO 1,	PO ₂	, PO 3
	comple	xity.							-				
PO ₁ - Engineer	ing Know	ledge, I	$PO_2 - Property PO_2 - Prope$	oblem a Moderr	inalysis,	$PO_3 - De$	esign/deve	elopment	t of so	olutions	5, P(Envi	\mathbf{D}_{4} - C	conduct
sustainability, P	O ₈ - Ethics	, PO 9- In	dividual	or team	work, P	0 ₁₀ - Com	nunication	, PO 11- P	roject r	nanagei	ment	and f	inance,
PO12- Life-long	Learning				,				5	0			,
		Мар	ping of	course	outcon	nes with	program	outcom	es	T			-
Course	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	F	PO 11	PO ₁₂
Outcomes		0	- 0			- 0		- 0	- 0	- 10			- 15
	2	3		2	2								
	3	3		2	3 3								
	2	2		3	5								
004		-	1 – Re	easonab	le: 2 – S	ianificar	ıt: 3 – Str	ona		1			
Detailed Cont	ents:				,	. <u>.</u>	,	J					
		Introd	luction	to Ma	chine	Learning	g - Defir	ning lea	arning	syste	ms,	Goa	ls and
		applic	ations o	of mach	nine lea	rning in	different	fields s	uch as	health	n cai	e, ba	nking,
Unit [.] 1		teleco	mmuni	cation,	digital ı	narketin	g and so	on. Aspe	ects of	develo	opin	g a le	arning
		syster	n: tra	ining	and t	esting	data, co	oncept	repr	esenta	tion	, fu	nction
		appro	ximatio	n, a gei	neral ov	erview c	of supervi	sed, ser	ni-sup	ervise	d, ur	isupe	ervised
		Ragios	ng aigo	nunns a	roducti	usage of	thon Co	oriunn.	notur	a and f	ino	tion	if_olif_
		else v	vhile lo	op for	loop br	eak and	continue	Introd	uction	t_0 fur	nctio	n Tx	mes of
		functi	ons. Fu	nction	argume	ents. Lan	nbda funo	tions. l	File Ha	andling	f. pa	ckag	es and
L Lo : 4. O		modu	les.		0	,		,		Ċ	, 1	0	
Unit: 2		Pytho	n Data	Structu	ires: Lis	sts, Tupl	es, Dictio	nary, Se	ets, sti	rings, l	Num	Py: N	NumPy
		operation, Array and its operation, Matrix and associated operations, Linear											
		algebr	a and r	elated of	operatio	ons using	g python.	Unders	tand t	he adv	anta	ge o	f using
		Pytho	n librar	ies for i	mplem	enting M	achine Le	earning	model	s. Type	es of	data	sets.
		Panda	s data	frame a	ind data	a trame	related of	peration	ns on	datase	t: Re	eadin	g and
Linit. 9		writin datafr	g uata	mes,	pandas	append	function	replace	t, aro	pping	COII	unns	rom v data
Unit. 3	,	analvo	anie, g. sis. Data	n Drenai	anu ag	nd nrem	rocessing	(Dealin	g with	missi	יטיקי. זע ער	alue	y uata
		valida	tion, cla	assificat	tion, per	rformanc	ce measu	те).	0		-9 ''		

		Data visualization on dataset using matplotlib and seaborn libraries: Scatter plot,					
		Line plot, Bar plot, Histogram, Box plot, Pair plot.					
		Regression - Linear, Non-linear, Logistic regression and Multiple regression, and					
		their applications.					
	Unit: 4	Classification technique - KNN, ANN, Decision Trees- Minimum Description.					
		Information Gain, Entropy, Cross Validation and different classification accuracy					
		metrics.					
		Clustering approaches - Types of clustering, k-means clustering, Partitioned-					
		based Clustering, Hierarchical Clustering, and Density-based Clustering.					
	Unit: E	Support Vector Machines: Maximum margin linear separators. Kernels for					
	Unit: 5 learning non-linear functions. Bayesian Learning: theory and Bayes rule. Na						
		Bayes learning algorithm. Parameter smoothing. Bayes nets and Markov nets for					
		representing dependencies.					
Exar	nination and Eval	uation Pattern: It include both internal evaluation (30 marks) comprising two class					
sessi	ional exams/ assig	ments/quiz/seminar presentation etc. and external evaluation (70 marks) which					
is ma	ainly end semester	examination.					
Text	Books:						
1	Tom Michel, Ma	ichine Learning, McGraw Hill, 1997.					
2	Introduction to	Machine Learning with Python, Andreas C. Mueller.					
3	Mastering Python for data science, Samir Madhavan.						
Refe	ference Books:						
1	Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh,						
	Cambridge Univ Press.						
2	McKinney, W. (20)12). Python for data analysis: Data wrangling with Pandas, NumPy, and iPython.					

Course Co	ode			C	ourse 7	Title			Lec	ture		
MTCS2121	РСТ			Inter	rnet of	Things			L	ТР	Seme	ster: II
Version: 1.2			Date o	f Appro	oval: 16t	h BoS 17	7-11-202	2	4	0 0		
	Scheme	of Instr	uction				Ş	Scheme o	of Exan	nination	<u>1</u>	
No. of	Periods	: 60	Hrs.					Ma	ximum	Score	: 10	00
Periods	/ Week	: 4						Interr	al Eval	uation	: 3	0
	Credits	: 4						E	End Ser	nester	: 7	0
Instructio	n Mode	: Lee	cture					Ez	kam Du	ration	: 3	Hrs.
Prerequisite(s): Compu :	iter Nei	tworks									
Lourse Object	Ives:	ation to	IOT									
1. VISIOII allu 2. Understan	d IoT Me	rket ne	101. erspecti	ve								
3 Data and H	Cnowledg	re Mana	agemen	ve. t and us	se of De	vices in	IoT Tec	hnology				
4 Understand State of Art-IoT Architecture and its implementation												
Course Outcomes (CO):												
COs No. Statement Mapped Program								ogram				
										Ou	tcomes	(POs)
CO ₁	Explain and Cha	& dem	onstrat s in IoT	e variou	ıs com	onents	of IoT a	long wit	h Issue	s	PO ₂ , P	O ₄
CO ₂	Apply a	ind ana	lyze th	e role	and im	portanc	e of Io	Γ in the	moder	n P	O1, PO2	, PO 5
CO ₃	Investig	gate and	l propo	se of va	rious re	quirem	ents of I	oT for rea	al Worl	d P	O ₂ , PO ₃	, PO 5
	applicat	tions.		-£	intin of	and a		and anala	:+ +		0 00	DO
CO_4	technol	e a v	for Io	$\int \frac{\partial f}{\partial r} dr$	to de	anu c scribe	and even	ng arch raluate d	lifforon	e P	$\mathbf{D}_1, \mathbf{P}\mathbf{D}_2, \mathbf{D}_1, \mathbf{P}\mathbf{D}_2, \mathbf{D}_1$	$PO_3,$
	applicat	tions of	the IoT	' anu	to de	SCHDE	anu ev	aluate (interen	ii ii	FO4, F	012
sustainability, PO PO12- Life-long 1	D ₈ - Ethics Learning	, PO 9- In	dividual	or team	work, PC	D_{10} - Com	municati	on, PO ₁₁ - P	Project m	nanagem	ient and	finance,
Course	_	iviup		course			program	li ouccon		_		
Outcomes	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂
CO ₁		2		2								
CO ₂	2	2			2							
CO ₃		2	2		2							
CO ₄	3	2	3	2								2
			1 – Re	asonabl	le; 2 – S	ignifica	nt; 3 – S	trong				
Detailed Cont	ents:		1			1	9	• • •			C	1.
Unit: 1		Basics	s of Net	to loT, working	g Comm	unicati	ire, Sens on Proto	ocols.	ation, E	Sasics o	f Netw	orking,
Unit: 2		Comn Comn	nunicat nunicat	ion ions an	Protoco d Introc	ols, S luction	ensor to SDN.	Netwoi SDN for	rks, IoT	Machir	ne-to-M	lachine
		Issues	s and C	halleng	es in Io	oT, Inte	roperab	ility in Io	oT, Inti	oducti	on to A	rduino
Unit: 2		Progr	amming	g, IoT o	develop	ment t	ools/pla	tforms,	Integra	ition of	f Senso	rs and
Unit. 5		Actua	tors wit	h Ardu	ino, Inti	roductio	on to Ras	spberry F	^p i, Imple	ementa	tion	
of IoT with Raspberry Pi.												
Unit: 4		IoT b	ased Cl	oud Co	mputin	ig, Sens	or-Clou	d, Fog C	omputi	ng, Sm	art Citi	es and
		Smart	Homes	s, Data I	Handlin	g and A	nalytics.	J. Tan alay meta	sial LaT	A		of IoT
Unit: E			ased Co	onnecte	ed venie	olthoor	art Grie	i, industi	rial lol	. Applic	cations	OF IOT,
Unit. 5		conce	study. F	sgricuit	ure, ne	aitiicait	e, Activit	ly Montu	ning, n	inpieme	Intation	01 10 1
Examination a	nd Evalu	ation F	Pattern:	It inclu	ide botl	n intern	al evalua	ation (30	marks)	compr	ising tw	o class
sessional exam	s/assig	nments	/ quiz/	semina	ar prese	entation	etc. and	l external	l evalua	tion (70) marks) which
is mainly end s	emester	examir	ation.		1					(· · ·	-,	
Text Books:												
1 Internet	of Thing	s: A Ha	ands-or	Appro	oach", b	y Arshc	leep Bal	nga and	Vijay N	ladisett	i (Univ	ersities
Press).												

2	The Internet of Things: Enabling Technologies, Platforms, and Use Cases, by Pethuru Raj and
	Anupama C. Raman (CRC
	Press).
Refe	erence Books:
1	Buyya, R., & Dastjerdi, A. V. (Eds.). (2016). Internet of Things: Principles and paradigms. Elsevier.
2	Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Francis daCosta,
	"Rethinking the
	Internet of Things: A Scalable Approach to Connecting everything", 1st Edition, Apress Publications,
	2013

Course C	ode			С	ourse T	itle			Lect	ture		
MTCS260	PCP	N	Machin	e Lear	ning wi	th Pyth	non – La	ab	L	T P	Sen	ester: II
Version: 1.2			Date of	f Appro	val: 16th	n BoS 17	-11-202	2	0	0 4		
	Scheme of	of Instr	uction					Scheme	of Exan	ninatior	1	
No. of	Periods	: 60	Hrs.					Ν	laximum	n Score	: 1	00
Periods	/ Week	: 4						Inte	rnal Eval	luation	: 5	0
	Credits	: 2							End Ser	mester	: 5	50
Instructio	on Mode	: Pr	actical						Exam Dı	ıration	: 3	Hrs.
Prerequisite(s	s): Knowl	edge o	f basic	data s	cience	algoritl	nms.					
Course Object	ives:											
1. To unders	tand the	basic co	oncepts	and te	chnique	s of ma	chine le	earning t	hrough	python	progr	amming.
2. To develop	o skills of	using r	ecent n	nachine	learnin	ig packa	iges for	solving	practica	l proble	ms.	
3. To gain ex	perience		ig indep	endent	study a	ind rese	earcn.					
4. To design	and imple	ement I	Machine	e learni	ng Algo	ritnms.						
Course Outco	mes (CO)	•			totomo	n t				Man	nod D	nodnom
COS NO.				2	lateme	nı				Map	peu P	rogram
CO	Abla to	domon	strato p	wthon r	nakada	C				Out		$\frac{s(POS)}{O_{2}}$
	Able to	donora	to and a	polyzo	and int	s orprot d	ata ugir	og pytho	n		$\frac{\mathbf{r}\mathbf{O}_{1}, \mathbf{r}}{\mathbf{D}\mathbf{O}_{2}, \mathbf{r}}$	02
	Lise Dut	bon to	design	and imr	anu inu ilement	classifi	ers for	nachine	11	DC	$\mathbf{P} \mathbf{O}_2, \mathbf{P}$	
03	learning	r annlie	ations	anu imp	летиени	Classifi		machine		r.	2, FO	s, FU4
CO	Implem	ent an	end-to-	end ma	chine l	earning	system			PO ₂		D₄ PO₅
PO ₁ - Engineeri	ng Knowl	edge. F	0 ₂ - Pro	blem a	nalvsis.	PO ₃ - D	esign/de	evelopme	nt of sc	olutions.	<u>PO₄</u> -	Conduct
investigations o	f complex	problen	ns, PO 5-	Modern	tool usa	ige, PO 6-	- The en	gineer an	d society	, PO 7- Ει	nviron	ment and
sustainability, P	08- Ethics,	, PO 9− In	dividual	or team	work, PC	010- Com	municati	ion, PO 11-	Project n	nanagem	ent an	d finance,
PO ₁₂ - Life-long	Learning											
	- r	Map	ping of	course	outcom	es with	progra	m outco	mes	1	1	
Course	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁	1 PO 12
Outcomes	1	1			-				-			
	1		2		-							-
		3	2	2								
		2	3 2	2	2							
		2	1 Do	2 200mahl		anifica	n+• 2 6	tron a				
Detailed Cont	onte		I - Ke	usonubi	le, 2 - 51	iynijicu	nı, 5 - 2	scrong				
Lah experime	nts are he	ased on	the syl	lahus r	rescrib	ed for I	Aachin	e learnir	na alaori	thm us	ing ni	thon
1 Basic data	structure	es and a	operatio	ons of n	vthon n	rooram	ming		ig aigui	unn us	ing Py	
2. Write the	python co	ode for	data cle	eaning t	the data	(Note:	Don't ir	nport re	nackage	in pyth	on)	
3. Write the	python c	ode for	finding	the Eu	clidean	distanc	e betwe	en two	lata poir	nts.	011)	
4. Write a py	thon cod	e for ha	andling	the mis	sing val	ue feati	ire in th	ne provid	led data	set.		
5. Implemen	tation of	k-neare	est neig	hbors (l	KNN) al	gorithm	to clas	sify the i	iris data	set. Pri	nt bot	h
correct an	d wrong	predict	ions. Py	thon M	IL librar	y classe	es can b	e used fo	or this p	roblem.		
6. Implemen	t the clas	sificatio	on prob	lem, tra	ining ai	nd testi	ng data	can be u	ised to b	uild cla	ssifica	tion
models.												
7. Implemen	t the clas	s of acc	euracy r	netrics	for clas	sificatio	n: prec	ision, ree	call, f1 sc	ore, acc	euracy	score.
8. Implemen	tation of	K -Mea	ns algo	rithm.	-		-					
9. Implemen	tation of	Decisio	n Tree-	based l	D3 algo	rithm. I	Jse an a	appropri	ate data	set for	buildi	ng the
decision ti	ree and a	pply thi	s know	ledge to	o classif	y a new	sample					
10. Implemen	tation of	the Ran	idom Fo	prest alg	gorithm	•		. 1 .		1 00	NT 7 C*1	
II. Implemen	tation of	inaive B	ayesian	i ciassif	ier for a	sample		g data se	et storec	i as a.CS	sv file	
12 Implement	tation of	acy OI t Simple	Lincer	Siller, C	vion usia	ing rew	rn	la sets.				
12. Implemen	tation of	regross	ion usir	negi ess	aon usii	ig skied	ill. es moti	bod				
14 Implemen	t the non	-naram	etric L	ig or uit Scally M	iai y ica: /ejohteo	i Regreg	cs meu	orithm	in order	to fit de	ata no	ints
Select app	ropriate	data sei	t for vo	ir exne	riment	and dra	w grant		in oraci	to nt u	ita po	
15. Implemen	tation of	Differe	nt multi	i-class s	SVM tec	chnique	s using	Binarv cl	lass SVM	l librarv		
16. Case study	v: Predict	ing the	price o	f pre-o	wned ca	ars. Clas	sifving	persona	l income		-	
		0 2				,	. 0	•				

- 17. Implementation of CNN using Tensorflow/Keras library and classify the Images (Note: Take your own dataset of your choice).
- 18. Implementation of Grid search and Random search using Logistic Regression.

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text	t Books:
1	Mastering python for data science, Samir Madhavan
2	Introduction to linear algebra - by Gilbert Strang
3	Machine Learning using Python, U Dinesh Kumar Manaranjan Pradhan
Refe	erence Books:
1	Applied statistics and probability for engineers – by Douglas Montgomery
2	McKinney, W. (2012). Python for data analysis: Data wrangling with Pandas, NumPy, and IPython. " O'Reilly
	Media

Course Co	ode			C	ourse 1	Title			Lec	ture		
MTCS261F	PCP			Intern	et of Th	nings La	b		L	ТР	Seme	ester: II
Version: 12	01		Date o	f Appro	val: 16t	h BoS 17.	-11-2022)	0	0 4		5001111
VCI 51011. 1.2	Scheme	of Instr	Duce o	mppro	val. 100	11 005 17	<u>11 2022</u>	Scheme (of Evan	nination	ן ז	
No. of	Deriods	\cdot 60	Hrs				ĸ	Ma	vimum	Score		100
Deriods	/ Wook	· 1	1115.					Interr	al Eval	untion	•	50
renous	Crodita	$\cdot \frac{4}{2}$						Interr	and Sor	nostor	•	50
Instructio	n Modo	$\cdot \Delta$	oction					I	sinu sei	rotion	•	2 Urg
Dronoguigito(g	Compu	. PI	actical					E.		liation	·	э пі s.
Prerequisite(s): Compu	lter Net	WOLKS									
Lundowstow	lves:	مسط فام		the Ol		<u>а</u> Т						
1. Understan	ding loT	davala	e role of	latform		01. duine D	aanham	••• D:				
2. Understan	ding to t	General	pinent p		ii iike Ai	duino, k	aspberr	у PI.				
3. Understan		Sensor	s and T	ningspe	eak.							
4. Create lol	applicat	ions.										
Course Outcon	nes (CO)	:									1.5	
COs No.				S	tateme	nt				Мар	ped Pro	ogram
										Out	comes	(POs)
CO ₁	Unders	tand co	re conc	ept of I	o'l' deve	elopmen	t.				PO ₁	
CO ₂	Unders	tand th	e conce	pt of Se	ensors,	Actuator	s and C	loud.		-	PO_1, PO_2) ₂
CO ₃	Unders	tand an	d creat	e the da	ata acqu	isition o	n cloud			PC	D ₂ , PO ₃ ,	PO ₄
CO ₄	Create	the IoT	applica	tions						PC) 3, PO 4,	PO ₅
PO ₁ - Engineerin	ng Knowl	edge, F	O 2- Pro	blem a	nalysis,	PO ₃ - De	sign/de	velopmen	t of so	olutions,	PO ₄ -	Conduct
investigations of	complex	problen	ns, PO 5-	Modern	tool usa	ige, PO 6-	The eng	ineer and	society	7, РО 7- Е	nvironn	nent and
BO _{w-} Life-long I	J ₈ - Ethics,	, PO 9- III	aividuai	or team	work, P C	J ₁₀ - Comm	numcatic	011, PO 11 ⁻ P	roject n	nanagem	ient and	nnance,
FO12- LITE-IOTIS I	Carning	Man	ning of	course	outcom	oc with	program	outcon	105			
Course		Map	ping of	course		les with	program	Toutcon	165	1		
Outcomer	PO ₁	PO_2	PO ₃	PO_4	PO ₅	PO_6	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂
CO	1											
	2	2										
	2	2	2	2								
CO3		2	2	2	2							
CO4			1 D-			· : ::	4.2 C4					
Details 1 Court			I - Ke	usonadi	le, 2 - 5	ignijican	11; 5 - 51	лопу				
Detailed Conto	ents:		1	1 1:00		с С. А.						
1. Study and	Install IL	E OF Ar	duino a		erent ty	pes of Ai	auinos.					
2. Write prog	gram usir	ig Arau	INO IDE	TOT BIII	IK LED.							
3. Write Prog	grain for	KGB LE	Dusing		10. Dua stat	C					•	
4. Study the	Tempera	ture se	nsor an		Progra	III IOF III	Shitor te	emperat	ure usi	ng Ardu	1110.	
5. Study and	impleme	nt MO), NFC (FT prote	ising Ar	uuino.	ina						
0. Study and	Configur	n NQ	army Di	JCOI USI	ng Arut	inno.						
8 WAD for U	ED bliget	c Kaspi	Derry Pl Daenhar	· rry Di								
0. WAP IUI L		nt 7igh	naspuel		ing Ard	uino / D	anhorm	v Di				
9. Study and 10 To underst	tand what	t is clo	ud its i	nporta	nce use	d = c = c = c = c = c = c = c = c = c =	ices and	y FI.	f Cloud			
10. To unders	rizo wit	h Thin	au, its ii aSpeak	and w	ndersta	nd the	procedu	ire of c	reation	Dofin	Chann	al over
Thing Space	LIZC WIU		ворсак	anu u	nucista	nu the	Procedi		reation	i Ui d	Chann	
12 To upload	л. DHT11 ол	neor d	ata to T	hingen	aak oho	nnel thre	ugh Do	nherry	ni2			
13 To upload	Light cer	sor (TS	SL) data	to Thir	oSneal	channel	through	h Raenh	pi2. errv ni)		
14 To read Lie	oht Sene	nr data	from Th	ingSpe	ak char	nel and	store it	into date	ahase ti	- hrough	Rasnhe	rry ni?
Fyamination a	nd Fyal	ation I	Dattern'	It inclu	ide hoti	interno	l evalua	$\frac{1100}{100}$	marke)	compr	ising tu	vo class
sessional evan	s / accin	nmente	/ 01117 /	semine	ac bou	ntation 4	etc and	externa	l evalus	tion (70) marke) which
is mainly end o	emester	examin	/ yui2/	Semili	a prese			encina	. Craiuc		, 11101 NO	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Text Rooler	emestel	Chailil										
1 Robro A	& Madi	otti V	(2014)	Intorno	t of The	nger A be	nda- or	annraa	h Vn+			
2 Vonori C		pagge	(2014). A (20)		da on	Inducted	al Inter	approat	Thin ~~	Cract		oworf-1
2 veneri, C	л., α. Са 1. гот	passo,	А. (20	юј. пап	105-011	musul	ai iiitei		migs	. creat	c a P	Swerrur
Industria	i IUI cture Uci	ing Ind	istry A		Dublic	ning I +d						
Deference Rec	line US	ing mu	usu y 4.0	J. Packl	, rudiisi	ing Ltd.						
Reference B00	KS.											

1	Seneviratne, P. (2018). Hands-On Internet of Things with Blynk: Build on the power of Blynk to
	configure smart
	devices and build exciting IOT projects. Packt Publishing Ltd.
2	Ziemann, V. (2018). A hands-on course in sensors using the Arduino and Raspberry Pi. CRC Press.

Course Co	de			C	ourse T	itle			Lec	ture		0	
MTCS270F	РСР		Mi	ni Proj	ect wit	h Semi	nar*		L	Т	Р	Sei	mester:
Version: 1.2			Date of	f Appro	val: 16tł	n BoS 17	-11-202	2	0	0	4		11
5	Scheme o	of Inst	ruction					Scheme	of Exan	nina	tion		
No. of	Periods	: 2	0 Hrs.					N	laximun	n Sco	ore	: 1	.00
Lab Hours	/ Week	: 10)					Inte	rnal Eva	luati	on	: 5	50
	Credits	: 2							End Se	mest	ter	: 5	50
Instruction	n Mode	: P	ractical]	Exam D	urati	on	: 3	3 Hrs.
Prerequisite(s)	:												
Course Objecti	ves:												
1. To understar	nd Softw	are re	quireme	nt speci	fication	and de	signing	method	ology.				
2. To familiariz	e of the s	yntax	, semant	ics, data	a-types	and libr	ary fun	ctions of	any pro	ograi	nmi	ng lai	nguages.
3. To apply ER	Diagram	, DFD,	UML for	design	ing the	softwar	e applic	cation.					
4. To implement	nt the spe	ecified	problen	ns.									
Course Outcon	nes (CO)												
COs No.				S	tateme	nt				N C	lapp Dutc	oed Pa	rogram s (POs)
CO ₁	Applyin	g SRS,	techniq	ues]	PO 2,]	PO3, P PO1	O ₈ , PO ₉ , 1
CO ₂	Apply D	esign	methods	s for giv	en SRS]	PO 3, I	PO5, P	O 9, PO 11
CO ₃	Write th	ne cod	es as per	r SRS ar	nd desig	ned Fra	mewor	k				PO ₃ , P	05
CO ₄	Able to	impleı	nent rea	l world	probler	n into s	oftware	solutior	1]	PO 3, 1	PO5, P	O ₉ , PO ₁₁
PO ₁ - Englineerin investigations of sustainability, PC PO ₁₂ - Life-long L	complex Sa- Ethics, earning	proble PO9- In Mar	ndividual	Modern or team	tool usa work, PC	PO3- Di 1996, PO6- 2010- Comi es with	• The eng municati	gineer an on, PO ₁₁ -	d society Project n	nanaş	ans, 7- En geme	PO ₄ - vironi ent and	d finance,
Course										_	_		
Outcomes	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO_6	PO ₇	PO ₈	PO ₉	PO	J ₁₀	PO ₁	1 PO ₁₂
CO ₁		2	2					2	2			2	
CO ₂			2		2				2			2	
CO ₃			2		2								
CO ₄			2		2				2			2	
			1 – Re	asonabl	e; 2 - Si	ignifica	nt; 3 – S	strong					
Detailed Conte	ents:												
Based *Students are e break. They ne supervisor. Examination a	on real- encourag eed to n nd Evalu	time/ ged to ged	in-house go to Ind a prototy Pattern:	e/ prob lustrial ' ype mo It inclu	olem spe Training del in t ide both	ecific g/Inter the allo	nship fo tted are al evalu	or at least eas on t ation (50	t 2-3 mo the reco	onths omm	s dui enda	ring s ation	emester s of the wo class
sessional exam	s/ assigr	nment	s/ quiz/	' semina	ar prese	ntation	etc. and	l externa	al evalua	tion	(50	mark	s) which
is mainly end s	emester	exami	nation.										
Text Books:													

1

Reference Books:

1

Course Co	de				C	ourse T	itle	Course Title Lectur								
MTCS370F	РСР				Dis	sertati	on-1			L	Т	Р	5			
Version: 1.2			D	ate of	f Appro	val: 16tl	n BoS 17	-11-202	2	0	0	20		11	1	
S	Scheme o	of I	nstruc	ction					Scheme	of Ex	amir	nation				
No. of I	Periods	:	20 H	Irs.					Μ	laxim	um S	core	:	700)	
Lab Hours	/ Week	:	20						Inter	rnal E	valua	ation	:	210		
	Credits	:	10							End	Seme	ester	:	490)	
Instruction	n Mode	:	Prac	ctical]	Exam	Dura	ation	:	-		
Prerequisite(s)	:															
Course Objecti	ves:															
 To underst To Review Proposals I 	and the Literatu Plagiarisi	res ire m a	earch and R nd Co	issues Resear pyrigl	s & chal ch Pap hts.	llenges, ers; Wi	researc riting R	ch goals esearch	, scientif Papers,	ic me Thes	thod sis, R	s. eport	s ar	nd Pi	roject	
Course Outcon	nes (CO)													-		
COs No.					S	tateme	nt					Mapp Outo	ped com	Prog les (I	gram POs)	
CO ₁	Underst	tan h.	d the i	issues	& chall	enges,	goals, so	cientific	method	s in			PO ₁	, PO 2		
CO ₂	Prepare	e a p h ir	oroject n a mo	t prop re apr	osal (to	under	take a p	roject) a	and cond	luct port			PO ₃	, PO 5		
PO ₁ - Engineerin	and dise	sert edø	tation.	- Pro	blem a	nalvsis	PO ₂ - D	esign /de	evelopme	nt of	solu	tions	PO	- 6	onduct	
PO ₁ - Engineerin investigations of sustainability, PO PO ₁₂ - Life-long L	and diss g Knowl complex 98- Ethics, earning	sert edg pro PO	tation. e, PO 2 blems, 9- Indiv	2- Pro PO ₅ -	blem an Modern or team	nalysis, tool usa work, PC	PO ₃ - Do age, PO ₆ - D ₁₀ - Com	esign/de The eng	evelopmen gineer and on, PO 11-	nt of d socie Projec	solu ety, F t mar	tions, 0 7- En nageme	PO 4 nviro ent a	- Co onme and fi	onduct nt and nance,	
PO ₁ - Engineerin investigations of sustainability, PO PO ₁₂ - Life-long L	and diss g Knowl complex 98- Ethics, earning	sert edg pro PO	tation. e, PO 2 blems, 9- Indiv Mappir	2- Pro PO ₅ - 1 vidual o	blem an Modern or team	nalysis, tool usa work, PC	PO ₃ - Do ge, PO ₆ - Do- Comp es with	esign/de The enq municati	evelopmen gineer and on, PO 11- m outcol	nt of d socie Projec mes	solu ety, F t mar	tions, PO 7- En nageme	PO4 aviro ent a	- Co onme and fi	onduct ent and nance,	
PO ₁ - Engineerin investigations of sustainability, PO PO ₁₂ - Life-long L Course Outcomes	and diss g Knowl complex 0 ₈ - Ethics, earning PO ₁	sert edg pro PO	tation. e, PO 2 blems, 9- Indiv Mappir O 2	PO ₅ - vidual ong of o	blem an Modern or team course PO ₄	nalysis, tool usa work, PC outcom PO 5	$\begin{array}{c} \mathbf{PO}_{3}- \ \mathbf{D}_{0}\\ \mathbf{ge}, \ \mathbf{PO}_{6}-\\ \mathbf{O}_{10}- \ \mathbf{Comm}\\ \mathbf{es \ with}\\ \mathbf{PO}_{6} \end{array}$	esign/de The enq municati program PO 7	evelopmen gineer and on, PO ₁₁ - m outcor PO ₈	nt of d socie Projec nes PO	solu ety, P t mar 9	tions, PO7- En nageme PO10	PO4 aviro ent a	- Co onme and fin	onduct ent and nance, PO ₁₂	
PO ₁ - Engineerin investigations of sustainability, PO PO ₁₂ - Life-long L Course Outcomes CO ₁	and diss g Knowl complex 0s- Ethics, earning PO ₁ 2	sert edg pro PO	tation. e, PO ₂ blems, 9- Indiv Mappir O ₂ 2	²⁻ Pro PO ₅ - 1 vidual c ng of c PO ₃	blem an Modern or team course PO ₄	nalysis, tool usa work, PC outcom PO 5	$\begin{array}{c} \mathbf{PO}_{3}- \ \mathbf{D}_{0}\\ \mathbf{ge}, \ \mathbf{PO}_{6}-\\ \mathbf{PO}_{10}- \ \mathbf{Com}_{10}\\ \mathbf{es with}\\ \mathbf{PO}_{6} \end{array}$	esign/de The en municati progran	evelopmen gineer and on, PO ¹¹⁻ m outcon PO ⁸	nt of d socie Projec nes PO	solu ety, P t mar 9	tions, PO7- Er nageme PO10	PO4 aviro ent a	- Co onme: and fin	onduct ent and nance, PO 12	
PO ₁ - Engineerin investigations of sustainability, PO PO ₁₂ - Life-long L Course Outcomes CO ₁ CO ₂	and diss g Knowl complex bs- Ethics, earning PO ₁ 2	sert edg pro PO	tation. e, PO2 blems, 9- Indiv Mappin O2 2	2^{-} Pro PO_5 - 2^{-} vidual of ng of of PO_3 2^{-}	blem an Modern or team course PO4	nalysis, tool usa work, PC outcom PO ₅	$\begin{array}{c} \mathbf{PO}_{3}- \mathrm{Do}_{3}\\ \mathrm{ge}, \ \mathbf{PO}_{6}-\\ \mathrm{Comm}\\ \mathrm{es \ with}\\ \mathbf{PO}_{6} \end{array}$	esign/de The en municati prograf PO 7	evelopmen gineer and on, PO ₁₁ - m outcon PO ₈	nt of d socie Projec mes PO	solur ety, P t mar	tions, PO7- En nageme PO10	PO4 nvircent a	- Co onme: and fin	ponduct nt and nance, PO ₁₂	
PO ₁ - Engineerin investigations of sustainability, PO PO ₁₂ - Life-long L Course Outcomes CO ₁ CO ₂	and diss g Knowl complex 0s- Ethics, earning PO1 2	sert edg pro PO N P	tation. e, PO2 blems, 9- Indiv Mappir O2 2 1	2- Pro PO ₅ - 2 vidual of PO ₃ 2 1 - Rec	blem ai Modern or team course PO4 asonabl	nalysis, tool usa work, PC outcom PO5 2 e; 2 – Si	PO ₃ - De ge, PO ₆ - ho-Commes with PO ₆	esign/de The en municati Progran PO7	evelopmen gineer and on, PO 11- m outcon PO 8	nt of d socie Projec nes PO	solu ety, P t mar	tions, PO7- En nageme PO10	PO4 aviro ent a	- Co onme: and fin	PO ₁₂	
PO ₁ - Engineerin investigations of sustainability, PO PO ₁₂ - Life-long L Course Outcomes CO ₁ CO ₂ Detailed Conte • Based	PO1 PO1 PO1 PO1 PO1 PO1 PO1 PO1 PO1 PO1	sert edg pro PO N P	tation. e, PO2 blems, 9- Indiv Mappir O2 2 1 1 n prob	2 Pro PO ₅ - 1 vidual of PO ₃ 2 1 - Rec	blem an Modern or team course PO4 asonabl	nalysis, tool usa work, PC outcom PO ₅ 2 e; 2 – Si	PO ₃ - D ge, PO ₆ - O ₁₀ - Com es with PO ₆	esign/de The en municati Progran PO7	evelopmen gineer and on, PO ₁₁ - m outcon PO ₈	nt of d socie Projec mes PO	solu ety, F t mar	tions, PO7- En nageme PO10	PO4 avircent a	D ₁₁	PO ₁₂	
PO ₁ - Engineerin investigations of sustainability, PO PO ₁₂ - Life-long L Course Outcomes CO ₁ CO ₂ Detailed Conte Based Examination an sessional exam which is mainly Text Books: 1	PO1 PO1 PO1 2 ents: on resea nd Evalu as / assig 7 end sen	sert edg pro PO P P P arch	tation. e, PO ₂ blems, p-Indiv Mappir O ₂ 2 1 h prob n Pat ter exa	2 Pros PO ₅ - 1 vidual of PO ₃ 2 1 - Rea blem R ctern: ' quiz, amina	blem an Modern or team PO4 asonabl R&D It inclu / semi ation.	nalysis, tool usz work, PC outcom PO5 2 e; 2 – Si de both nar pre	PO ₃ - Do ge, PO ₆ - Dro- Com es with PO ₆ gnifican	esign/de The enq municati progran PO ₇ nt; 3 – S al evalua on etc.	evelopmen gineer and on, PO ₁₁ - m outcon PO ₈ strong	nt of d socie Projec mes PO) marl ernal	solu ety, F 9 9 ks) co eval	tions, PO ₇ - En nageme PO ₁₀	PO4 avircent a P(g two	PO12 PO12	
PO ₁ - Engineerin investigations of sustainability, PC PO ₁₂ - Life-long L Course Outcomes CO ₁ CO ₂ Detailed Conte Based Examination an sessional exam which is mainly Text Books: 1 Reference Bool	PO1 PO1 PO1 2 ents: on resea nd Evalu is/ assig r end sen	serti edg pro PO N P	tation. e, PO ₂ blems, 9- Indiv Mappir O ₂ 2 1 n prob n Pat ter ex:	2 Pro PO ₅ - : vidual of PO ₃ 2 1 - Rec vidual of vidual of PO ₃ 2 1 - Rec vidual of vidual of PO ₃	blem an Modern or team course PO4 asonabl asonabl It inclu / semi ation.	nalysis, tool usa work, PC outcom PO₅ 2 e; 2 - Si de both nar pre	PO ₃ - D ge, PO ₆ - O ₁₀ - Com es with PO ₆ gnificat	esign/de The ena municati Progran PO7 nt; 3 – S al evaluation etc.	evelopmen gineer and on, PO ₁₁ - m outcon PO ₈ Strong	nt of d socie Projec mes PO o marl ernal	solu ety, F 9 9 ks) co eval	tions, PO ₇ - En nageme PO ₁₀	PO4 avircent a P(g twcc	PO12	

Course Co	ode				C	ourse T	itle			L	ectu	re			
MTCS4701	PCP				Dis	sertati	on-2			L	Т	Р	2	emest	er:
Version: 1.2			J	Date of	Appro	val: 16tł	n BoS 17	/-11-202	2	0	0	28		1V	
1	Scheme o	of I	nstru	uction					Scheme	of Ex	amir	nation			
No. of	Periods	:	40	Hrs.					М	laxim	um S	core	:	800	
Lab Hours	/ Week	:	40						Inter	mal E	valua	ation	:	240	
	Credits	:	14							End	Semo	ester	:	560	
Instructio	n Mode	:	Pra	actical					I	Exam	Dura	ation	:	-	
Prerequisite(s)):														
Course Object	ives:														
Course Outcon	nes (CO)	:													
COs No.					S	tateme	nt					Map	ped	Progr	am
												Out	com	es (PC)s)
CO ₁	To unde	erst	and	the res	earch is	ssues &	challen	iges, res	search go	als,			PO ₁ ,	PO ₂	
	scientif	ic n	nethe	ods.				-	_						
CO ₂	To Revi	ew	Liter	ature a	nd Res	earch P	apers; \	Nriting	Research	1			PO ₃	PO ₅	
	Papers,	Th	esis,	Report	s and P	roject P	roposal	ls Plagia	rism and	1					
	Copyrig	ghts	5.			-		_							
PO1- Engineerir	ng Knowl	edg	e, P	O ₂ - Pro	blem ai	nalysis,	PO 3- D	esign/de	evelopmei	nt of	solu	tions,	PO ₄	- Con	duct
investigations of	complex	pro	blems	s, PO 5-1	Modern	tool usa	ge, PO 6-	- The en	gineer and	d socie	ety, F	0 7- Er	iviro	nment	and
sustainability, PC	D ₈ - Ethics,	ро	9- Ind	lividual o	or team	work, PC	0 ₁₀ - Com	municati	ion, PO 11-	Projec	t mar	nageme	ent a	nd fina	nce,
PO12- LITE-TOTIS I	learning	N	Jann	ing of a	ourse	outcom	es with	progra	moutcor	nec					
Course			lapp		Jourse			Program		nes					
Outcomes	PO ₁	P	O 2	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	РО	9	PO ₁₀	PO	D ₁₁ I	'O 12
CO ₁	2		2												
CO ₂				2		2									
				1 – Red	ısonabl	e; 2 – Si	gnifica	nt; 3 – S	Strong						
Detailed Conte	ents:														
Based	on resea	arch	1 pro	blem R	&D										

Examination and Evaluation Pattern: It include both internal evaluation (240 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (560 marks) which is mainly end semester examination.

Text Books:

Reference Books:

1

PROGRAM ELECTIVES

Course C	ode			(Course	Title			Le	ctur	e			
MTCS1111	PET		A	dvance	d Netw	ork Sec	urity		L	Т	Р	Se	emes	ter: I
Version: 1.2			Date	of Appr	oval: 16	th BoS 1	7-11-2022		3	1	0			
	Scheme	e of Ins	truction	1			S	cheme o	f Exar	nina	tion		10.0	
No. of I	Periods	: 60) Hrs.					Ma	aximu	m Sc	ore	:	100	
Periods	/ Week	: 4						Inter	nal Ev	aluat	tion	:	30	
Instruction	o Mode	: 4 · 16	oturo					F	Ellu S	lurat	tion	•	70 3 円	ra
Prerequisite	e(s): Net	work 9	Securit	V				Ľ		uia	1011	·	511	. 5.
Course Obie	ctives:	WOIR	Jeeun	-y										
 To und To und threats 	erstand erstand in the	d the o d vario netwo	concep ous pro orks.	ot of se otocols	ecurity s for no	/ and pi etwork	rivacy. security	, to pro	tect a	ıgai	nst t	he		
3. To und	lerstan	d E-m	ail sec	urity,	PEM&	S/MIN	IE, PGP,	Firewa	lls.					
4. To intr	oduce	new d	evelop	ing se	curity	feature	es.							
Course Outo	comes (C	:0):			~									
COs No.					Stater	nent					Maj Ou	ppeo tcoi	l Pro nes (gram POs)
CO ₁	Under: system	stand 1s and	the de real ti	evelopi ime co	ing sec mmur	curity for the second sec	eatures securit	in netw y.	orkii	ng	PC PC	D_1, I $D_5, 1$	PO2, PO10,	PO4, , PO ₁₂
CO ₂	Implen	nent v	arious	netwo	rking I	protoco	ls.					PO	з, Р С)4
CO ₃	Apply networ	resear rk secu	ch in tl urity.	he eme	erging	areas o	f crypto	graphy	and		PC)₃, I	PO 4,	PO ₅
CO ₄	Analyz world.	e and	prote	ect an	y netw	vork fro	om the	threats	in t	he	PC	96, F	PO 9,	PO ₁₂
sustainability, PO ₁₂ - Life-lon	PO ₈ - Eth g Learnin	ics, PO 9 Ig M	- Individ	ual or tea	am work se outc	, PO 10- Co	mmunicati	on, PO ₁₁ -	Project	man	lagem	ent a	and fi	nance,
Course Outcomes	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	F	PO ₁₀	Р	O ₁₁	PO ₁₂
CO ₁	2	3		3	2	1				_	1			2
			2	3	0					_				
			2	2	3	1			0	_				0
			1	Dagaam	able: 2	Signific	ant. 2 C	troma	Z					Ζ
Detailed Con	ntents		1-	Reason	uble, 2 -	- Siyniju	uni, 5 - 5	scrong						
Unit: 1	1	Introc princi Euler' Algori Advar	luction iples of s functi ithm ty nced En	to the c security ion, Syr pes an cryptio	oncept y, modu nmetric d Mod n Stand	s of Secu Ilar arith c Crypto es, Inter ard (AES	rity: The r metic, pri graphy: C mational)	need for s me num)verview Data Er	securi bers, 1 of sy hcrypt	ty, se elat mme ion,	ecurit ive pr etric Algo	ty ap rime cryp orith	proa nun otogr m (I	iches, ibers, aphy, DEA),
Unit: 2	2	Asym: ElGan	metric (nal Algo	Cryptog rithm, l	raphy: (Knapsao	Overviev ck Algori	v of asymı thm, Ellip	netric cr tic Curve	yptog e Cryp	raph togr	iy, Ro aphy	bin	algor	rithm,
Unit: 3	3	Identi Kasah	ity Base ara IBE	d Crypt (SK-IB	ograph E), Bone	y: Introd eh-Boyer	uction, Bo 1 IBE, (BB-	oneh-Fra -IBE)	Inklin	IBE ((BF-II	BE),	Saka	i-
Unit: 4	4	Public Digita	e Key In Il Signat	frastruo ture, Me	cture: D essage I	igital Ce ntegrity,	rtificates, Message	Key Maı Authent	nagem icatio	ent. 1, En	Hasł tity A	n Fu Auth	nctio entic	ns, cation
Unit: 5	5	Secur and T IDS, F	ity at th LS. Secu irewalls	ie App <mark>li</mark> urity at s.	cation I the Net	Layer: En work Lay	nail, PGP. ver: IPSec.	Security System	at the Securi	e Tra ty: N	inspo ⁄Ialici	rt L ous	ayer: Prog	SSL rams,
Examination sessional exa	n and Ev	aluatio signme	n Patte nts/ qu	rn: It in iz/ sem	clude b inar pro	oth inter esentatio	rnal evalu on etc. and	ation (30 1 externa) mark al eval	s) co 1atic	ompri on (70	sing ma	g two rks) v	class which
is mainly end	d semest	er exai	ninatio	1.										
Text Books:														

1	Cryptography and Network security, Behrouz A. Forouzan and Debdeep Mukhopadhyay, McGraw
	Hill.
2	Introduction to Modern Cryptography, Jonathan Katz and Yehuda Lindell, CRC Press.
Refe	erence Books:
1	Understanding Cryptography, Christof Paar and Jan Pelzl, Springer.
2	Cryptography and Information Security, V K Pachghare, PHI.

Course C	ode				Course	Title			Le	ectu	re		
MTCS112	PET			Distr	ibuted	Databas	e		L	Т	Р	Sei	nester: II
Version: 1.2	<u>a 1</u>	67.4	Date	of Appr	:oval: 16	th BoS 17	<u>-11-2022</u>	1	3	1	0		
No. of I	Scheme	of Inst	ruction	1			S	cheme o	t Exai	nina	tion		100
NO. 01	/ Wool	: 60	Hrs.					Intor	axiinu pol Er	III SC	tion	:	20
Perious	Credits	· 4						men	Fnd S	eme	ster	•	30 70
Instruction	n Mode	: Le	cture					E	xam l	Dura	tion	•	3 Hrs.
Prerequisite	(s): Data	base M	anagem	ent Sys	stem	l		-		Juiu		•	0 11101
Course Obje	ctives:		0	<u>,</u>									
 To und To lear process 	erstanc m cono sing.	l princ cepts	relate	and fou d to a	undation rchite	ons of d cture, o	istribut lesign i	ed data ssues,	base integ	s. grity	v cor	ntro	l, query
3. To uno facilitie	lerstan s, inclu rprot ti	d the dingc	conce oncur	ept of rency	f a da contro	tabase ol, back the me	transac up and i	ction an recover	nd ro 'y. nodo	elate	ed d	latal	base
4. To litte	latabas	e desi	on whi	symb ich oft	en inv	olves c	st popu onflictin	iai EK li no onals	lioue	iing	, 1001	15. A	nu rear-
Course Outo	comes (C	<u>0):</u>	511 1011			01763 6	Jimeen	ig goals	•				
COs No.	()	- /-			Staten	nent					Mar	oped	Program
											Ou	tcon	nes (POs)
CO ₁	Unders principl	tand an es, incl	d succe uding E	ssfully -R diag	apply lo rams ar	gical dat 1d databa	abase de: ise norma	sign alization.			РО	⁰ 1, P P	O2, PO3, O4
CO ₂	Design	and imp	olement	a smal	l distrib	uted dat	abase pro	oject.			PO	3, P	O4, PO9
CO ₃	Unders tools in	tand th contex	e mode t to rea	eling sy l-world	mbols f l databa ls	or the n se desig	nost popu n which	ılar ER r	nodel	ing	PO)2, P P	O3,PO4, O9
CO ₄	Apply distribu	optimiz ted env	zation, vironme	transa transa	actions,	and	concurrei	ncy cor	ntrol	in	PC	D 1, P 0	D ₁₁ , PO ₁₂
investigations sustainability, PO ₁₂ - Life-lon	of compl PO 8- Ethi g Learnin	ex probl .cs, PO 9- g Ma	lems, PC Individu apping (05- Mode al or tea	ern tool am work, se outco	usage, PO PO 10- Cor omes wit	6- The eng nmunicati h program	gineer and on, PO 11- I m outcor	1 socie Project nes	ety, P t man	O 7- E1 nageme	nviro ent a	nment and nd finance,
Outcomes	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO	, I	PO ₁₀	PC	P ₁₁ PO ₁₂
CO ₁	3	2	3	2									
		-	3	2					2				
<u>CO</u> ₃	0	2	3	3					2			0	0
CO4	Z		1	D	-1.1 - 0	<u> </u>		4				Z	Z
Detailed Cor	tonta		1-1	keason	able; 2 –	Signific	ant; 3 – 5	trong					
Unit:	l	Introc Promi databa	luction: ses of ase, ado	Distrit DDBSs litional	outed Da Problem function	ata Proco n Areas. ns of Dis	essing, wl advantag tributed o	hat is a D ges and database)istrib disad , distr	uted vanta	l Data ages ed DE	abase of di 3MS,	e System? stributed
Unit: 2	2	Distril Distril Altern Replic replic	buted I buted I ative ation, F ation.	DBMS A DBMSs, Design Replicat	orchitec Distribu Strate ion Tecl	ture: DB uted DBI egies, E hniques,	MS Stand MS Archit Pistributic Fragmen	dardizati cecture. I on Desi tation sc	on, Ai Distril gn I hema	rchit outeo ssue , allo	ectur d Dat s, Fi cation	ral M abas ragn n scł	lodels for e Design: nentation, nema data
Unit: (3	Overv Proce Proce Optim Optim	iew of ssing, ssing. C nization nization	Query Comple Query D , Cent: <u>Alg</u> orit	Process exity of ecompo ralized <u>chms.</u>	sing: Qu f Relation sition a Query	ery Proce onal Alge nd Optim Optimiza	essing Pr ebra Op ization: (tion, Ser	robler eratic Query mi jo	n, O ons, Dec ins	bjecti Laye compo Distri	ives ers o ositio ibute	of Query of Query on, Query ed Query
Unit: 4	1	Trans prope Contr based	action rties o ol Mech Concu	Manage f Tran nanisms rrency	ement a sactions s, Lockir Control	nd Conc s, Serial ng-based Algorith	zurrency zability Concurr ms, Dead	Control: Theory, ency Cor lock	Defir Taxo ntrol A	nitior nom Algor	n of a y of rithms	Tra Cor s, Tir	insaction, acurrency nestamp-

		Management.
		Distributed DBMS Reliability: Reliability Concepts and Measures, Failures and Fault
	Unit: E	Tolerance in Distributed Systems, Failures in Distributed DBMS, Local Reliability
	Unit: 5	Protocols, Distributed Reliability
		Protocols.
Exar	nination and Ev	aluation Pattern: It include both internal evaluation (30 marks) comprising two class
sess	ional exams/ ass	signments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which
is m	ainly end semest	er examination.
Text	: Books:	
1	OzsuM. Tamer,	ValduriezPatrick, "Distributed Database Systems", 2nd Edition, Pearson, 2011
2	Ceei and Pelaga	atti,'Distributed Database', TMH.
Refe	erence Books:	
1	NavatheElmasr	i, "Fundamental of Database Systems", 5th Edition, Pearson Education, 2008. Page 210
	of 243 2	
2	ConnollyThoma	as, BeggCarolyn, "Database Systems – A Practical Approach to Design, implementation
	and Manageme	nt", 4th Edition, Pearson Education, 2008.

Course C	ode			(Course	Title			Lec	ture		
MTCS113	PET			Γ	Data Sc	ience			L	Г Р	Seme	ester: I
Version: 1.2			Date o	of Appr	oval: 16	th BoS 17	7-11-2022		3	1 0		
	Scheme	of Inst	ruction	1			S	cheme o	f Exami	nation	, , ,	
No. of l	Periods	: 60	Hrs.					Ma	aximum	Score	: 100	0
Periods	/ Week	: 4						Inter	nal Eval	uation	: 30	
	Credits	: 4							End Sei	nester	: 70	
Instruction	n Mode	: Leo	eture					E	xam Dı	iration	: 3 F	Irs.
Prerequisite	(s): Data	a ware	house	and Da	ata Mi	ning						
Course Obje	ctives:	1 (1)	. 1	1.	1		. 1		C: •	. 1 .	· ·	
1. To prov	/ide wit	the the	knowle	edge a	nd exp	Dertise	to becor	ne a pr	oficier	it data	scient	tist.
2. To Den	ionstra 1 for do	te an i	inders	tandir	ng or s	tatistics	s and ma	icnine I	earnir	ig con	cepts t	that
3 To Proc	$\frac{1}{1}$	tascie	nce ode to	a stati	stically	z analys	es a dat	acot				
4 To Cri	tically	evalua	ate da	ta vis	sualiza	tions l	ased o	aset m thei	r des	ion ai	nd us	e for
commu	nicatin	g stori	ies fro	m data) 1		Juseu e	in the	i ues	-B u	iu us	0 101
Course Outo	omes (C	0):			-							
COs No.		- /-			Staten	nent				Ma	oped Pr	ogram
										Ou	tcomes	(POs)
CO ₁	Unders	tand the	e conce	pts - O	btain, c	lean/pro	cess, and	transfo	rm data	PC	D 1, PO 4	, PO 5
CO ₂	Analyze	and int	terpret	data us	ing an e	ethically	responsib	le appro	ach.		PO ₂ , P	O ₈
CO ₃	Apply 1	nathem	atical	and st	atistica	l models	s, and th	ne princ	iples o	of PC	D ₁ , PO ₄	, PO 5
	optimiz	ation to	approp	oriately	formul	ate and ı	ise data a	nalyses	-			
CO ₄	Interpr	et data i	findings	s visuall	y, and i	n writter	n formats			PC	2, PO 3	, PO 10
PO ₁ - Enginee	ring Kno	wledge,	PO ₂ - F	Problem	analysi	s, PO 3-	Design/de	velopmer	it of so	lutions,	PO ₄ - (Conduct
investigations	of compl	ex probl	ems, PO	5- Mode	rn tool i	usage, PO	6- The eng	ineer and	l society	, PO 7- E	nvironm	ent and
PO ₁₂ - Life-lone	PO ₈ - Eun	CS, PO 9-	maiviau	arortea	III WOLK,	PO ₁₀ - COI	mmumcauo	511, PO 11 ⁻ I	Project ii	lanagem	entand	imance,
	5 Learnin	5 Ma	anning (of cours	se outco	mes wit	h progran	n outcon	nes			
Course				50			- <u>F - 68</u>	-		20		
A .	PO1						11/1				P()11	PO12
Outcomes	101	FO2	PO ₃	PO ₄	PO5	PO_6	P U 7	108	r Og	FO 10	101	1 012
CO ₁	3	102	PO ₃	2 PO4	2 PO5	PO ₆	P U 7	108	rOg	FO 10	TON	1012
Outcomes CO1 CO2	3	3	PO ₃	2	2	PO ₆	P O 7	3	FOg	P O10	TON	
Outcomes CO1 CO2 CO3	3	3	PO ₃	2 3	2 3		P07	3				
Outcomes CO1 CO2 CO3 CO4	3	3 2	PO3	2 3	2 3 3		PO7	3		3		
Outcomes CO1 CO2 CO3 CO4	3	3 2	PO ₃	2 3 Reasona	2 3 3 able; 2 -	PO ₆	PO7 ant; 3 – Si	3 trong		3		
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2	Jure Leskovek, AnandRajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1,											
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	Cambridge UniversityPress.											
Refe	erence Books:											
1	Field Cady, The Data Science Handbook, Wiley											
2	Jake VanderPlas, Python Data Science Handbook: Essential Tools for working with Data,											
	OReily											

Course C	ode					Course	Title			Lec	ture		
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CO ₃	Apply o	nto	logy	engine	ering a	pproacl	nes in sei	mantic ap	plicatior	ıs]	PO3	, PO 4
CO ₄	Underst search e	tan eng	d W ine,	eb graj commu	ph proo nity de	cessing tection	for vari	ous appli	cations	such as	s PO	¹ , P P	O5, PO8, O12
investigations sustainability, PO 12- Life-long	of compl PO 8- Ethi g Learning	ex p cs, l g	proble P O 9-	ems, PO Individu	5- Mode al or tea	ern tool u m work,	1sage, PO PO ₁₀ - Cor	6- The eng	ineer and on, PO 11- I	l society Project m	, PO 7- Er nanageme	nviro ent a	nment and nd finance,
	-		Ma	pping o	of cours	se outco	omes wit	h progran	n outcon	nes	r	<u> </u>	
Course	PO ₁	Р	O ₂	PO ₃	PO_4	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO	PO ₁₁ PO ₁₂
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		al	gori	thms,	Langua	age ext	ensions						U
L Inite (St	truc	tured	Web	Docum	ents ir	N XML:	Introdu	iction,	XML,	Str	ucturing,
Unit: 2	2	N	ame	spaces	s, Addr	ressing	andque	rying XN	1L docu	ment, l	Process	sing	-
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Unit: 3	3	X	ML-	Based	Synta	x, RDF	serializa	tion, RDF	Schem	a: Basic	ldeas,	RDI	Schema:
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Unit: 5	5	Э D	PAR	QL: SP	ARQL	simple	Graph	Patterns	, Compi	lex Gra Formal	pn Pau Somar	tio	is, Group
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Text Books:													
1 John D	avies, R	udi	Stu	der, a	nd Pau	l Warr	en John	"Seman	tic Web	Techn	ologies	: Tr	ends and

	Research in Ontology-based Systems", Wiley and Son's, 2006.
2	John Davies, Dieter Fensel and Frank Van Harmelen, "Towards the Semantic Web: Ontology-
	Driven KnowledgeManagement", John Wiley and Sons, 2003.
Refe	erence Books:
1	Foundation of Semantic Web Technologies, Pascal Hitzler, Markus and Sebastian
2	Michael C. Daconta, Leo J. Obrst, and Kevin T. Smith, "The Semantic Web: A Guide to the
	Future of XML, Web Services, and Knowledge Management", Fourth Edition, Wiley
	Publishing, 2003.

Course C	ode			(Course	Title			Le	cture			
MTCS1211	PET			Inte	lligent	Systems			L	T P	Se	emest	ter: I
Version: 1.2			Date o	of Appro	oval: 18t	h BoS 27	-02-2024		3	1 0			
	Scheme	of Inst	ruction	l			Sc	heme of	f Exan	ninatio	n	г	
No. of	Periods	: 60	Hrs.					Ma	ximun	n Score	:	100	1
Periods	/ Week	: 4						Intern	al Eva	luation	:	30	
Instructio	Credits	: 4	oturo					E E	ind Se	mester	:	/0	Ing
Prerequisite	a) Artifi	cial Inte	lligence	2				EX.		uration	•	зп	15.
Course Object	tives:		ingeneo	-									
1. To provid	le the co	ncepts	of intell	igent sv	/stems.								
2. To develo	p proble	em solvi	ng skills	s by sea	rching.								
3. To explai	n knowle	edge rep	present	ation, p	roblem	solving,	and reaso	ning.					
4. To deal w	rith unce	ertainty	and des	sign age	ents to h	andle th	em.						
Course Outco	omes (C	D):											
COs No.					Statem	ent				Ma	appeo	l Prog	gram
	TT 1	. 1.1	1			1.1.	· · · · 1	11.		0	utcor	nes (I	POs)
CO ₁	Unders	stand the	e chara	cteristic	cs, scop	e and lin	nits of the	intellige	ent		РО	\mathbf{PO}_{2}	2
<u> </u>	system	S.	oblom	oluingh	NI GOORG	hing					DO	DO	
	Analyz	b a lan as		solving t	by searc	ming	l		:		PO	2, PU	/3
CO ₃	Apply t	ne knov	viedge i	represe	ntation,	problem	i solving,	and reas	soning			$\frac{1}{2}$, PO	<u>15</u>
CO_4	Analyze	e the rea	asons ic nts to k	or uncer	tainty,	DIOIOgica	ai inspired	algoriti	nms	P	J 4, P	O 9, F	2010
PO 1- Engineer	ing Kno	wledge.	PO ₂ - P	roblem	analysis	PO 3- D	esign/dev	elopment	ofs	olutions	PO	- Co	nduct
investigations	of comple	ex proble	ms, PO ₅	- Moder	n tool u	sage, PO 6	- The engi	neer and	societ	y, PO ₇ - 1	Enviro	nmen	nt and
sustainability, I	PO8- Ethio	cs, PO 9- I	ndividua	al or tean	n work, F	PO 10- Com	munication	n, PO 11- P	roject	manager	nent a	nd fin	nance,
PO12- Life-long	Learning	5		0									
		Maj	pping o	f course	e outcoi	mes with	program	outcom	es				
Course	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	Р	D ₁₁	PO ₁₂
COL	2	2	}								+		
	5	2	2										
		2	2	2	2						-		
<u> </u>				2	-				2	3			
			1 – R	l – Leasonal	ble: 2 – 1	Sianifica	nt: 3 – Sti	rona	_	0			
Detailed Con	tents:				,		, 0 20	eng					
		Intro	duction	and (Overvie	w of In	telligent	System	is an	d Intel	ligen	t Ag	ents:
		Histor	ry and I	Foundat	tion of I	ntelligen	t Systems	s, Knowl	edge-	based s	ystei	ns, Ex	xpert
Unit: 1		System	ms. In	telligen	t Agen	ts: Agei	nts and	Enviror	ment	s, Cha	racte	ristic	s of
		Intelli	gent A	gents, I	Definitio	on of a F	ational A	gent, St	ructu	re of a	n Age	ent, R	eflex
		agent	s, Goal-	-based a	agents,	Utility-b	ased agen	ts, Mult	i-ager	nt Syste	ms.		
TT-14-C		Probl	em Solv	ving by	Search	: Uninfoi	med Sear	ch (Blin	d Sea	rch): BF	S, DI	S, De	epth-
Unit: 2		Limite	ed Sea	rcn, It	erative	Deeper t Sooroh	ling DFS	, Biaire	Soore	al Sea b	rcn;	Infor	rmea
		(neul	and Ad	vorsari	al Sear		l, A [*] Seal (Search 9	Searc	11. tod An	nooli	na So	arch
Unit: 3	ł	Local	Beam	Search.	Online	Search [.]	Adversar	ial Sear	onnuia ch∙ Tł	ne mini	max	algori	ithm
01110.0	,	Alpha	-Beta P	runing.	Omme	bearen,	nuversai		CII. II		шал	aigori	iciiii,
		Know	ledge	Repres	entatio	n and l	Reasoning	g: Prop	ositio	nal Log	gic: (Opera	ators,
I Inite		Infere	ence, Ee	quivaler	nce, Val	idity, Sa	tisfiability	, Resolu	ition;	First C	rder	Pred	icate
Unit: 4	ŧ	Logic	(FOPL)	; Infere	ence in	First Or	der Logic	; Rule I	Based	System	n; Foi	ward	l and
		Backv	vard Ch	aining;	Semant	ic Netwo	ork.						
		Biolog	gical Fo	undatio	ons to I	ntelliger	nt System	s : Artifi	cial N	eural N	etwo	rks (A	ANN):
		Neuro	ons, He	ebb's R	lule, Si	ngle &	Multi-lay	er Per	ceptro	on, Ba	ck-pi	opag	ation
Unit: 5)	Algori	thm; G	enetic	Algorith	nms: Cro	ssover, N	lutation	, Sele	ction; I	ntro	luctic	on to
		Partic	are Swai	rm Opti	mizatio	n; Introc	iuction to	Ant Co	ionies	Optim	izatio	on; Hy	ybrid
Evomination	and Free	luation	Bottom	stems.	lude be	th intorn	al avaluat	ion (20 -	marka) comp	riging	two	class
sessional eva	anu Eva	onment	raller	semir	nar nreg	entation	etc and	oui (30 l external	evalu	ation (7	nsinf U ma	rke) 14	vhich
is mainly end	semeste	er exami	nation.	/ 501111	pres				e varu		5 1110		

Text	t Books:
1	CrinaGrosan, Ajith Abraham, "Intelligent Systems: A Modern Approach ", Springer-Verlag, 2011
2	Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 4 th ed., Pearsons,
	2022
Refe	erence Books:
1	Adrian A. Hopgood, "Intelligent systems for engineers and scientists", 4 th ed., CRC press, 2021
2	Denis Rothman, "Artificial Intelligence By Example", Packt Publishing, 2018

Course C	ode			С	ourse T	`itle			Lec	ture		
MTCS122	PET		Au	gmente	ed & Vi	rtual Re	ality		L	Т Р	Seme	ester: I
Version: 1.2	~ •		Date of	f Appro	oval: 16t	h BoS 17-	-11-2022	_	3	1 0		
	Scheme	of Insti	ruction				S	<u>cheme</u>	of Exan	nination		
NO. 01	Periods	: 60) Hrs.					N. Inter	laximun	n Score	: 10	0
Periods	Credits	$\begin{array}{c} \cdot & 4 \\ \cdot & A \end{array}$						Inte	Find Se	mester	: 30	<u>ן</u> ר
Instructio	on Mode	· -	ecture						Exam D	uration	: 3	Hrs.
Prerequisite	(s): Artific	ial Inte	lligence)					Linuin D	urution		1110.
Course Obje	ctives:		0									
1. To unde	rstand t	he basi	c conc	ept an	d frame	ework o	f virtua	l realit	у.			
2. To und	erstand	the e	lement	s, arc	hitectu	re, inp	ut and	outpi	it devi	ices of	virtua	l and
augmen	ted reali	ty syste	ems.									
3. To explo	ore the r	esearcl	h issue	s in Au	gment	ed Reali	ty and V	/irtual	Reality	' (AR &V	′R).	
4. To Unde	erstand A	AR envi	ronme	nts								
Course Outc	omes (CO):										
COs No.					Statem	ent				Maj Ou	pped Pr tcomes	ogram (POs)
CO ₁	Analyze (AR&VR	the res	search i	ssues ir	n Augme	ented Re	ality and	Virtual	Reality	PO	D ₁ , PO ₂	, PO 3
CO ₂	Evaluat area like	e the m e educa	ain app tion gai	lication mes etc	of VR a	nd AR te	chnolog	ies in va	arious	PO	$\mathbf{D}_1, \mathbf{PO}_2$, PO 5
CO ₃	Analyze	the rol	e and ir	nportai	nce of V	R &AR in	the mo	dern wo	orld.	PO	3, PO 4	, PO9
CO ₄	Create	the App ges face	lication ed	of 3D i	in Augm	ented Re	eality and	d the			PO ₂ , P	O ₁₂
sustainability, PO 12- Life-long	PO 8- Ethic g Learning	s, PO 9- II	ndividua	l or team	n work, P	0 ₁₀ - Com	municatio	on, PO 11-	Project	managem	ent and t	finance,
Course		Ivia		course			program					
Outcomes	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂
CO ₁	2	2	3									
CO ₂	3	2			2							
CO ₃			1	2					2			
CO ₄		2										2
Detailed Com	tonta		1 – R	easonal	ole; 2 – S	Significa	nt; 3 – Si	trong				
Unit:	1	Introd	luction	of Virtı	ual Reali	ity: Fund	amental	Conce	pt and (Compon	ents of	Virtual
		Realit	y. Prima	ary Feat	tures an	d Preser	nt Develo	pment	on Virt	ual Reali	ty.	
Unit	2	Senso	r Digit	eis of fi al Glo	nput and	u Outpui	Capture	Video	-based	Input	3D Me	racker,
Onit.		3DSca	inner et	c. Outr	out - Vis	sual /Au	ditory /	, videe Haptic	Devices	input,	SD MIC	inus a
		Visual	Comp	utation	in Vir	tual Rea	ality: Fu	ndamer	tals of	Compu	iter Gra	aphics.
Unit	3	Softw	are an	d Har	dware	Techno	logy or	Stere	eoscopio	e Displa	ay. Adv	vanced
Office.	0	Techr	iques i	in CG:	Manag	ement o	of Large	e-Scale	Enviro	nments	& Real	l Time
		Rende	ering.	ochnice	iog in V	Sintual De	olitza De	dr. Tro	olt Hon	d Coatu	ma 201	Vonue
		Object	t Grasn	Develo	ues III v	Tools an	d Frame	works i	ск, пап n Virtu	u Gestu al Reality	re, od i v Frame	works
		of Sof	tware D	evelop:	ment To	ols in VI	R. X3D St	andard	; Vega, I	MultiGe	n, Virto	ols etc.
Unit:	4	Applic	ation of	f VR in I	Digital E	ntertain	ment: VF	R Techn	ology in	Film & T	rv Prod	uction.
		VR T	echnolo	ogy in	Physica	l Exerci	ises and	l Game	es. Dem	onstrat	ion of	Digital
		Enter	tainmer	nt by VF	<u>}.</u>						0	
		Δ11σm	optod o		11				-			a a m t a d
		nugili			ed Reali	ty, Taxo	nomy, te	chnolo	gy and f	features	of augn	
Unit:	5	reality	onality	na Mix ence b Augme	ed Reali between	ty, Taxo AR and ality met	nomy, te 1 VR, Cl hods vie	chnolo nallenge sualizat	gy and f es with ion tech	features AR, AR	of augn systen	ns and

	projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.
Exa	mination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class
sess	ional exams / assignments / quiz / seminar presentation etc. and external evaluation (70 marks) which
is m	ainly end semester examination.
Text	t Books:
1	Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press,
	2003/2006.
2	Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann,
	2013.
Refe	erence Books:
1	Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of
	Effective Design, Morgan Kaufmann, 2009.
2	Gerard Jounghyun Kim, Designing Virtual Systems: The Structured Approach, 2005.

Course C	ode			(Course '	Title			Leo	ture		
MTCS123	PET			So	ft Com	puting			L	Т Р	Seme	ester: I
Version: 1.2			Date o	of Appr	oval: 16	th BoS 17	7-11-2022		3	1 0		
	Scheme	of Inst	ruction				Sc	heme o	f Exam	ination	l	
No. of	Periods	: 60) Hrs.					Ма	ximum	Score	: 1	100
Periods	/ Week	: 4						Intern	al Eval	uation	: :	30
	Credits	: 4						E	End Sei	nester	: '	70
Instructio	n Mode	: Le	ecture					Ex	kam Di	iration	: :	3 Hrs.
Prerequisite(s): Machi	ne Leai	ning, N	IATLAB								
Course Object	tives:							0				
1. To intro	duce sof	t comp	outing of	concep	ts and	techniq	ues and	foster	their a	abilities	in des	signing
appropria	ite techn	ique foi	a giver	i scena	r10.	· 1	1					
2. To implei	nent son	compu	iting-ba	sed sol	utions I	or real-v	voria pro	blems.	oforti	Ficial no		
3. To provid	e knowle	edge of	non-tra	altiona		logies a	na iunaai	nentais	of arth	icial ne	urai net	works,
Tuzzy set	s, iuzzy ic	t honde		zoriana	15.		implomo	nt vorio	ua atro	torior		
4. TO provid	mag (CO		-on exp	berienc	e on MA	LAD LO	Impleme	nt vario	us stra	tegies.		
COurse Outco	Jilles (CO	·)·			Statom	ont				Mo	nnod Dr	orrom
COS NO.					Statem	ent					tcomes	(DOs)
CO	Evaluat	e soft	compu	ting te	chniqu	es and	their ro	es in 1	huildin	о 0	1000000000000000000000000000000000000	\mathbf{PO}_4
COI	intellige	ent mac	hines.	ting to	ennqu	cs and	then to	C3 III	Junum	6	102, 1	04
CO ₂	Apply fi	izzv log	ric and 1	easoni	ng to ha	ndle und	certainty	and solv	re	PO	D1. PO 3	. PO₄
	various	engine	ering pr	oblems	8 5.						- ,	, 1
CO ₃	Apply g	enetic a	algorith	ms to c	ombina	torial op	timizatio	n proble	ms.	PC	D ₂ , PO ₃	, PO 4,
	11.70		0			1		1			PO	2
CO ₄	Evaluat	e and co	ompare	solutio	ns by va	rious so	ft comput	ing app	roache	s	PO ₂ , P	O 4
	for a giv	ven pro	blem.		5		1	0 11			,	
PO ₁ - Engineer	ing Knov	/ledge,	PO ₂ - Pr	oblem	analysis,	PO 3- D	esign/dev	elopmen	t of so	olutions,	PO ₄ - (Conduct
investigations	of comple	x proble	ms, PO ₅-	Moder	n tool us	age, PO ₆ -	- The engi	neer and	society	, РО 7- Е	nvironm	ent and
	'O 8- Ethic	s, PO 9-1	ndividua	l or tean	n work, P	0 10- Com	municatio	n, PO 11- P	roject n	nanagem	ent and	finance,
FO12 LIFE IONS	Learning	Mai	ning of	Course	outcor	nes with	program	outcom	les			
Course		iiiaj	ping of	course			program	outcon				
Outcomes	PO ₁	PO_2	PO ₃	PO ₄	PO ₅	PO_6	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂
CO ₁		1		3								
CO ₂	3		3	2								
CO ₃		3	2	2								2
CO ₄		3		3								
			1 – R	easonal	ble; 2 – S	Significa	nt; 3 – Sti	ong			•	
Detailed Con	tents:					00		U				
		Intro	ductio	n to s	Soft C	omputi	ng and	Neura	l Net	work:	Evolut	ion of
Unit: 1	l	Com	outing:	Soft	Comp	uting C	onstitue	ents, Fi	rom (Conven	tional	AI to
		Com	outatic	nal In	telliger	nce: Ma	chineLe	arning	Basics	5.		
		Fuzz	y Logi	e: Fuzz	zy Sets	s, Oper	ations o	n Fuzz	y Set	s, Fuzz	zy Rela	ations,
Unit: 2	2	Mem	bershi	p Fun	ctions	: Fuzzy	Rules	and F	uzzy	Reaso	ning,	Fuzzy
		Infer	ence S	ystem	s, Fuzz	y Exper	rt Systen	ns, Fuz	zy De	cision	Making	g.
		Neur	al Net	works	: Mach	ine Lea	arning U	sing N	eural	Netwo	rk, Ad	aptive
										Ionri	ning l	Neural
		Netw	orks,	Feed	forwa	ard Ne	tworks,	Super	vised	Lean	8	•
Unit: 3	3	Netw Netw	orks, orks,	Feed Radial	Basis	ard Ne Functio	tworks, on Netw	Super orks: F	vised einfo	rceme	nt Lea	rning,
Unit: 3	}	Netw Netw Unsu	orks, orks, pervis	Feed Radial ed Le	Basis earning	ard Ne Functio g Neu	tworks, on Netw ral Net	Super orks: F works	vised einfo , Ada	rcemer	nt Lea Reso	rning, nance
Unit: 3	3	Netw Netw Unsu archi	orks, orks, pervise tecture	Feed Radial ed Lo es, Adv	forwa Basis earning vances	ard Ne Functio g Neu in Neu	tworks, on Netw ral Net ral netw	Super orks: F works: orks.	vised einfo Ada	aptive	nt Lea Reso	rning, nance
Unit: 3	3	Netw Netw Unsu archi	orks, orks, pervise tecture tic A	Feed Radial ed Le es, Adv Igoritl	Basis Basis earning vances hms:	ard Ne Functio g Neu in Neu Introdu	tworks, on Netw ral Net ral netw action t	Super orks: F works orks.	vised Reinfo Ada netic	Algor	nt Lea Reso ithms	(GA),
Unit: 3 Unit: 4	} 	Netw Netw Unsu archi Gene Appli	orks, orks, pervise <u>tecture</u> tic A cation	Feed Radial ed Le es, Adv Igoritl s of GA	forwa Basis earning vances hms: A in Ma	ard Ne Functio g Neu in Neu Introdu achine L	tworks, on Netw ral Net ral netw iction t earning:	Super orks: F tworks orks. to Gen Machi	vised Reinfo , Ada netic ne Lea	Algor	nt Lea Reso ithms Appro	rning, nance (GA), ach to
Unit: 3 Unit: 4	} 	Netw Netw Unsu archi Gene Appli Knov	orks, orks, pervise tecture tic A cation vledge	Feed Radial ed Le es, Adv Igoritl s of GA Acquis	forwa Basis earning vances hms: A in Ma sition.	ard Ne Functio g Neu in Neu Introdu chineL	tworks, on Netw ral Net ral netw action t earning:	Super orks: F works orks. orks. Machi	vised Reinfo Ada netic ne Lea	Algor	nt Lea Reso ithms Appro	rning, nance (GA), ach to
Unit: 3 Unit: 4 Unit: 5	3	Netw Netw Unsu archi Gene Appli Knov Rece	orks, orks, pervise tecture tic A cation vledge nt Tren	Feed Radial ed Lo es, Adv Igoritl s of GA Acquis nds in a	forwa Basis earning <u>vances</u> hms: A in Ma sition. deep le	ard Ne Functio g Neu in Neu Introdu achine L earning,	tworks, on Netw ral Net ral netw action t earning: various	Super orks: F orks. orks. co Gen Machi classifi	vised Reinfo Ada netic ne Lea iers, n	Algor arning eural r	ithms Appro	rning, nance (GA), ach to ks

Exan sess	mination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class ional exams/assignments/quiz/seminar presentation etc. and external evaluation (70 marks) which
is m	ainly end semester examination.
Text	t Books:
1	Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro: Fuzzy and Soft Computing, Prentice: Hall
	of India,2003.
2	George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall, 1995.
Refe	erence Books:
1	Luger G.F. and Stubblefield W.A. (2008). Artificial Intelligence: Structures and strategies for Complex
	Problem Solving. Addison Wesley, 6th edition.
2	Russell S. and Norvig P. (2009). Artificial Intelligence: A Modern Approach. Prentice-Hall, 3rd Edition.

Course C	ode				Course	Title			Leo	ture		
MTCS124	PET			Dig	ital Fo	rensics			L	Т Р	Seme	ester: I
Version: 1.2			Date	of Appr	oval: 16	th BoS 1	7-11-2022		3	1 0		
	Scheme	of Inst	ruction				So	cheme of	f Exam	inatior	1	
No. of	Periods	: 60	Hrs.					Ma	ximum	Score	: 10)0
Periods	/ Week	: 4						Intern	al Eval	uation	: 3	0
	Credits	: 4						E	Ind Sei	mester	: 7	0
Instructio	n Mode	: Le	cture					Ex	am Du	iration	: 3	Hrs.
Prerequisite	(s): Cybe	r Secu	rity									
Course Object	ctives:		at of C	la o mom		li cital f		طنحنهما م		a 0 :t	~ ~ 1 ~	
I. Underst		conce	ptorC	ybercr	ime & o	ligital I	orensic,	digital e	viden	ce & it	s role.	
2. Interpre		y vario	us aigi			lodels.	an in aide					
3. Interpre	et & appi	y vario	us pna	ses or	metho		on inclae	ent.				
4. Interpre	et & appi	y aigita	al forei	ISIC IC	ois in r	eai-1in	ne scena	r10.				
Course Outc	omes (CC):			Statom					Ма	mmod D	
COS NO.					Statem	lent				Ma	pped Pl	Ogram
CO	Analyz	e the r	eed fo	r cybe	rcrime	invecti	ation a	nd unde	retan	d 00	DO. D	$(\mathbf{r} \mathbf{O}_{\mathbf{s}})$
COI	the her	dwara	and co	ftword		ononta	gation al	hlo for c	ookin	u a	I O ₁ , I	05
	ule hai	uware	and so	ntware	comp	onents	responsi	DIE IOI S	беекш	g		
CO	Amplei	<u>.</u>	daa aa	thata	ahaiau		for only	ating				DO
CO_2	Apply I	cnowie	age on	the te	cnniqu	es used	for colle	ecting		P	O_1, PO_2	, PO ₃ ,
	eviden	ces.	• •	. 1			1			-		
CO ₃	Analyz	e the e	videnc	e throu	ugh sui	table to	ols.			P	O_3, PO_4	, PO ₅ ,
		-									PO ₁	0
CO ₄	Analyz	e other	sourc	es of e	videnc	es				P	O_2, PO_3	, PO 4
PO ₁ - Enginee	ring Knov	wledge,	PO ₂ - P	roblem	analysis	, PO ₃ - I	Design/dev	velopment	t of so	olutions,	PO ₄ - (Conduct
sustainability	POs- Ethic	s. PO 9-1	ndividuz	al or tear	n work. F	sage, PO 6 PO 10- Con	municatio	n. PO 11- P	roject r	/, PO 7- f nanagen	nent and	finance.
PO ₁₂ - Life-long	g Learning					- 10		,	j			,
		Ma	pping o	f cours	e outco	mes witł	n program	outcom	les			
Course	PO,	PO ₂	PO	PO	PO-	PO	PO-	PO	PO	PO	PO.	PO ₁₀
Outcomes	101	102	103	104	105	100	10/	10.	109	1 010	IOI	1012
CO ₁	2				2						-	-
	2	3	3	3						-		-
CO ₃		-	3	2	1					3		
CO ₄		2	3	2	11.0	ac.	(A					
Detailed Corr	4 4 4		1 - K	leasona	ble; 2 –	Significa	int; 3 – St	rong				
Detailed Con	itents:	Introd	luction	to Die	stal Ear	ongioge	Cubanania	mag Tru	og of	Cuban	onim og	Digital
		Fyider		to Dig	rensice	Classifi	cation of	Ties, Typ Cyber	Forence	Cyber vice Di	vital Fo	rensics
Unit:	1	Proce	ss peoi	ber ro	olved in	SFL set	ting up a	Forensic	rorena rs Lab	Buildir	ig a Co	mnuter
		Foren	sic Too	l kit.	nieu m	511, 500	ung up u	1 01 011010	b Luo,	Dunun	ig u co	inputer
		Under	rstandir	ng Harc	l Disks	and File	Systems	Disk Dr	rive &	Types	of Disk	Drives,
I In it.	.	Physic	cal stru	icture	of KDI	D, HDD	Åddress	ing, Typ	bes of	Partit	ions, B	ooting,
Unit: A	2	Differ	ence be	etween	Cold Bo	t Warm	Bot, File S	ystems,	FAT &	NTFS, I	List of F	orensic
		softwa	are use	d for Fil	le Syster	m Analys	sis.					
		Defea	ting Ar	nti-Fore	ensics []	Techniqu	ies, vario	ous Anti-	-foren	sics Te	chnique	es, File
Unit: 3	3	recov	ery too	ls for V	VINDO	VS OS,	Partition,	Partitio	n reco	very T	ools, Pa	ssword
		Crack	er. Dat	a acqu	isition	& Dupli	ication, L	ive data	acqu	isition	& Stat	ic data
		acquis	sition, L	Data Aco	quisition	1 & Dupl	ication Ha	ardware	& Soft	ware To	DOIS.	
		Netwo	OFK FOI	ensics:	Active	& Pass	sive Netv	ork Foi	rensics	s, Type	ion Cha	llongog
Unit	1	in Wo	aviiitie	s. mves	Forensi	s vved Al	tome of	Web Att	acke c	ruiens tens fo	r invest	igating
	I	Web	attacke	Invect	jgation	us, synn Weh ∆t	tacks in	WINDON	NS &	LINITX	hased o	servers
		Mobil	e Foren	sics. an	alvzing	malicio	is files		, 5 U		Subcu c	
		Data	Base Fo	rensics	: Datab	ase. Dat	abase For	ensics.	analvzi	ng DB	Files us	ing DB
Unit:	C	Brows	ser for S	SQLite.	IOT Fo	rensics,	Perform	ning Da	ta Ac	quisitio	n in A	ndroid

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	Devices. Cloud Forensics: Cloud computing, Cloud Forensics, types of Cloud
	services, Types of Cloud Deployment Models, Challenges faced by investigators
	during Cloud Forensics, investigating E-mail Crimes, E-mail Forensics Tools.
Exa	mination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class
sess	ional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which
is m	ainly end semester examination.
Text	t Books:
1	Dr. Nilakshi Jain, Dr. Dhanajay R. Kalbande
2	Richard Boddington, Practical Digital Forensics, PACKT publishing, First Edition, 2016 ANDRÉ
	ÅRNES.
Refe	erence Books:
1	Practical Mobile Forensics, PACKT publishing , 2014 Satish Bommisetty, Rohit Tamma,
	Heather Mahalik
2	"Guide to Computer Forensics and Investigations" 4e, Nelson, Phillips Enfinger, Steuart,
	Cengage Learning.

	ode				Course	Title			Le	ctur	e			
MTCS160	PEP		Adv	anced	Netwoi	The Lecture ork Security Lab L T 6th BoS 17-11-2022 0 0 4							mest	er: I
Version: 1.2			Date	of Appr	:oval: 16	th BoS 1	7-11-2022		0	0	4			
	Scheme	e of Inst	ructior	ı			S	cheme o	f Exan	ninat	tion			
No. of	Periods	: 60	Hrs.					M	aximu	n Sc	ore	:	100	
Periods	/ Week	: 4						Inter	nal Ev	aluat	ion	:	50	
	Credits	: 2							End S	emes	ster	:	50	
Instruction	n Mode	: Pr	actical					E	Exam E	ourat	tion	:	3 Hrs	s.
Prerequisit	e (s): Net	work S	ecurity	y Lab										
Course Obje	ctives:													
1. To unde	rstand a	nd prot	ect the	netwoi	rk infras	structure	, archited	cture, pro	otocol	s and	l app	licat	ions i	in
order to	deliver	secured	l protoc	cols, app	plicatio	ns, servio	es and da	ata.						
2. To Trair	hthe stud	dents to	o develo	op 'hanc	ls-on' s	kills on u	sing tools	s and tes	t beds	in oi	rder.			
3. To desig	gn netwo	rk and a	security	y experi	iments/	/simulati	ons.							
4. To prep	are the s	tudents	s to peri	form cr	itical th	inking, i	dea genei	ration an	d impl	eme	ntati	on, a	ind	
integrat	ion with	existing	g syster	ns whe	n solvin	g real re	search pr	oblems.						
Course Out	comes (C	:O):												
COs No.					Stater	nent					Mar	pped	Prog	gram
											Ou	tcon	nes (F	POs)
CO ₁	Demon	strate t	he abili [.]	ty to ur	ndersta	nd and s	ynthesize	e the prir	nciples	of		\mathbf{PO}_1	, PO 2	2
	networ	k securi	ity arch	itectur	es and s	security f	ramewor	ks and m	odels;					
CO ₂	Unders	tand Da	ita integ	grity, Au	uthentic	cation, D	igital Sigr	natures.			PO)3, P	O4, 1	PO ₅
CO ₃	Analyze	, desig	n and	manage	e the r	equirem	ents of a	secure	netwo	ork	J	PO ₂	, PO	3
	archite	cture ba	ased on	risk an	alysis a	nd opera	tional							
	require	ments i	n accor	dance v	with reg	gulations	and stan	dards.						
CO ₄	Analyze	Variou	s netwo	ork secu	urity app	plication	s, IPSec, I	Firewall,	IDS, W	'eb	PC) ₄ , P	O5, F	PO 12
	security	, Email	securit	y, and l	Maliciou	ıs softwa	ire etc.							
PO ₁ - Engined	ering Kno	owledge.	PO ₂ -	Problem	analysi	is. PO 3-	Design/de	evelopme	nt of	solut	ions,	PO ₄	- Cor	nduct
					5		0,							
investigations	of comp	lex prob	lems, PC	D5- Mod	ern tool	usage, PC	₀- The en	gineer an	d socie	ty, P	0 7- E1	nviro	nmen	it and
investigations sustainability,	of comp PO ₈ - Eth	lex prob ics, PO 9-	lems, PC Individu	0 ₅- Mode ual or tea	ern tool am work	usage, PC , PO 10- Co	0 6- The en mmunicat	gineer and ion, PO 11-	d socie Project	ty, P man	0 7- Ei agem	nviro ent a	nmen nd fin	it and ance,
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investigations sustainability PO ₁₂ - Life-lor Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co 1. Write 2. Write 3. Write 4. Write 5. Write 6. Write 8. Write 8. Write 8. Write 8. Write 9. Study throu	PO1 PO1 2 PO1 2 ntents: a Progra a Progra bakai-Ka Boneh-Bra y the we gh a bur	lex prob ics, PO ₉ - g PO ₂ 2 2 2 cam to cam to can to ca	PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3	Ds- Mode al or tea of cour PO4 3 2 Reason anent In nent Ra nent El nent El nent El nent El nent El nent El nent El nent Di ement Di ement Di ement Di ement Di ement Di ement Di ement Di ement Di ement Di	ern tool am work. se outco PO5 2 2 3 able; 2 - ternation dvanced bin Alg Gamal napsack liptic C igital Si the ID	PO ₆ PO ₆ PO ₆ PO ₆ PO ₆ Signific onal Dat d Encryp gorithm. Algorith c Algorith c	m hm. yptograp conf code btion of e	m outcom m outcom PO ₈ PO ₈ Strong otion Alg ndard (A ohy (ECC phy algo	d socie Project mes PO ₉ corithi ES) Al	p P P I I I I I I I I I I I I I I I I I	O7- E1 agem O10 DEA). thm.	ent a PC	nmen nd fin Du	PO ₁₂
investigations sustainability PO ₁₂ - Life-lor Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co 1. Write 2. Write 3. Write 4. Write 5. Write 6. Write 7. Write 8. Write 8. Write 1. S iii. E 9. Study throu	PO1 PO1 2 PO1 2 ntents: a Progra a Progra bakai-Ka Boneh-Fra Bakai-Ka Boneh-Bay the we gh a bur	lex problex ics, PO ₉ - g PO ₂ 2 2 2 cam to ram to ranklin sahara oyen II b serve ffer oved d /lab	PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3	Ds- Mode al or tea of cour PO4 3 2 Reason and 2 Reason and 1 nent In nent Ra nent El nent Ki nent El nent El nent El nent El nent El nent El nent El nent El nent Di ement I S-IBE) de, and Write xt; use	ern tool am work. se outco PO5 2 2 3 able; 2 - ternation dvanced bin Alg Gamal napsack liptic C igital Si the ID l find e down a e the fo	PO ₆ PO ₆ PO ₆ - Signific onal Dat d Encryp gorithm. Algorith c Algorith c	m hm. yptograp conf code period code perio	m outcom m outcom PO ₈ Btrong Strong otion Alg ndard (A ohy (ECC phy algo	d socie Project nes PO ₉ (orithine ES) All c).	P P P I I I I I I I I I I I I I I I I I	O7- E1 agem PO10 DEA). thm.	y cc e filo	nmen nd fin Du	PO ₁₂
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investigations sustainability PO ₁₂ - Life-lor Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Co 1. Write 2. Write 3. Write 4. Write 5. Write 6. Write 8. Write 8. Write 8. Write 9. Study throu /hon descr	PO ₈ - Eth g Learnin PO ₈ - Eth g Learnin PO ₁ 2 ntents: a Progression a	lex problex ics, PO ₉ - g M PO ₂ 2 2 2 cam to cam to can to	PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3 PO3	Ds- Mode al or tea of cour PO4 3 Reason anent In nent In nent Ra nent El nent Ki nent El nent Ki nent El nent Ki S-IBE) C-IBE) de, and Write xt; use may ov test) to	ern tool am work. se outco PO5 2 2 able; 2 - ternatid vanceo bin Alg Gamal napsack liptic C igital Si the ID l find e down a e the fo verflow	PO ₁₀ - Co omes with PO ₁₀ - Co omes with PO ₆ - Signific onal Dat d Encryp gorithm. Algorith calgorith cal	h progra h progra PO7 PO7 PO7 a Encryp otion Star m hm. yptograp cryptogra s of code otion of e escribed rou woul buffer, a	m outcom m outcom PO ₈ PO ₈ Strong otion Alg ndard (A ohy (ECC phy algo e vulnera each vuln in that id struct nd whe	d socie Project nes PO ₉ PO ₉ corithm ES) Al c).	p man p p m (II gori s:	PO- Enagem PO10 DEA). thm.	PC P	orrup e erab the	PO ₁₂

Exa	mination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class
sess	ional exams/assignments/quiz/seminar presentation etc. and external evaluation (50 marks) which
is m	ainly end semester examination.
Text	t Books:
1	Practical Cryptography in Python, James Nielson and Christopher K. Monson, Apress
	Publication.
2	Applied Cryptography: Protocols, Algorithms and Source Code in C, Bruce Schneier, Wiley.
Refe	erence Books:
1	Practical Cryptography for Developers, Svetlin Nakov, https://cryptobook.nakov.com/ (This
	book is freely available.)
2	Practical Cryptography: Algorithms and Implementations Using C++, Saiful Azad and Al-Sakib Khan
	Pathan, CRC Press. Source Code: https://sites.google.com/site/spathansite/praccrypt
3	Virtual Lab: http://cse29-iiith.vlabs.ac.in/Introduction.html

C	Course C	ode				Course	rse Title				cture			
N	ATCS161	PEP			Distrib	uted Da	atabase	Lab		L	T P	Sei	nester: I	
Vers	sion: 1.2	~ 1		Date	of Appr	:oval: 16	Sth BoS 17-11-2022 0 0 4							
		Scheme	of In	struction	1			S	cheme o	f Exan	inatio	<u> </u>	10.0	
	$\frac{NO. \text{ of I}}{D \cdot 1}$	Periods	:	60 Hrs.			-		Ma		n Score	:	100	
	Periods	week		4					Inter	nal Eva	aluation		50	
Inc	struction	v Modo		Dractical	1				F	End Se	uration		2 Urg	
Dror	struction	1 Mode	al Elc	otropica	1				E	xam L	uration		5 HIS.	
Com	rse Ohie	ctives	ai Eic	cuonics										
1 I	Underst	and pri	ncinl	es and fo	undati	ions of	distribu	ted data	hases					
2. I	Learn ce	oncepts	rela	ted to ar	chitect	ture. de	esign iss	ues. inte	grity co	ntrol.	auerv	proce	ssing.	
3. U	Underst	and the	e con	cept of	a datal	base tr	ansactio	on and r	elated d	ataba	se faci	lities.	8.	
i	includin	g con	curre	encycon	trol, ba	ckup a	nd reco	very.				,		
4.	To inter	pret the	e mo	deling sy	mbols	for the	e most p	opular E	R mode	ling to	ools. Ai	nd real	-world	
(databas	e desigr	n whi	choften	involve	es conf	licting g	oals.		0				
Cour	rse Outc	omes (C	O):											
CO	s No.					Stater	nent				Μ	apped	Program	
											0	utcom	es (POs)	
	<u>о</u> .	Be able	to ap	ply metho	ods and	techni	ques for	distribute	ed query			PO1,	PO ₂	
	201	process	ing a	nd optimi	zation.									
C	CO_2	Underst	nderstand distributed database systems architecture and design. PO₃, PO₄											
C	CO 3	Underst	nderstand the broad concepts of distributed transaction process. PO₃, PO₄, PO₅											
C	CO4Implement of replication in distributed database systemPO3, PO4, PO5, PO0													
DO	Enginee	ring Kno	wlode		Drohlam	analyci		Design /de	velonmer	t of a	olution	. DO	Conduct	
inves	tigations	of compl	ev pro	blems P	r- Mode	ern tool	13, FU3- 11990e PO	Design/ut	velopillei vineer and	l societ	$\mathbf{v} \mathbf{P} \mathbf{\Omega}_{}$	5, FU 4- Enviror	ment and	
susta	inahility	PO₀- Ethi	ics P (– Individi	alortez	am work	PO 10- CO	nmunicati	on PO ₁₁ - I	Project	nanage	ment ar	nd finance	
PO ₁₂ -	- Life-lon	g Learnin	g	5 marria		ini work,	1010 001	innuneut	011, 1 011 1	roject	manage	inent ui	la manee,	
		0		Mapping	of cour	se outco	omes wit	h prograi	n outcon	nes				
Co	ourse	DO.	DO	PO.	DO.	PO-	PO.	PO-	DO.	DO	PO.	DO		
Out	tcomes	101	10	103	104	105	100	10/	108	109	ION	10	1012	
	CO ₁	2	3											
	CO_2			2	2									
	CO ₃			3	2	3								
	CO ₄			2	2	3				2				
				1 -	Reason	able; 2 -	 Signific 	ant; 3 – S	trong					
Deta	ailed Cor	ntents:												
List	of Excr	rement												
1. I	Examine	e and im	nplen	nent of B	asic da	itabase	manage	ement op	perations	s and	SQL qı	eries.		
2. I	Examine	e and im	plen	ient frag	menta	tion an	d its typ	es in dis	tributed	datab	oase sy	stem.		
3. I	Examine	e and im	plem	ent mate	erialize	d view.								
4. I	Implem	ent diffe	erent	types of	joins.									
5. I	Implem	ent hete	eroge	neous d	atabas	es.								
6. I	Examine	e and in	plen	nent of re	eplicati	ion in d	listribut	ed datab	ase syst	em.				
7. <i>I</i>	A mini p	roject b	ased	on Distr	ibuted	Datab	ases.							
Exan	nination	and Eva	aluati	on Patte	r n: It in	clude b	oth inter	nal evalu	ation (50	marks	s) comp	rising	two class	
sessi	ional exa	ms/ass	ignm	ents/ qui	z/ sem	inar pre	esentatio	n etc. and	l externa	l evalu	ation (S	0 marl	ks) which	
is ma	ainly end	i semest	er ex	aminatior	1.									
Text	BOOKS:	. m		1		D'	4.15	-1 ~		01.5	1.4.	D -	0.011	
1	OzsuM	. Tamer	, val	luriezPat	$\frac{1}{1}$	Distribu	ited Dat	abase Sy	stems",	2nd E	aition,	Pearso	on, 2011	
2	Ceei ai	nd Pelag	gatti,'	Distribut	ed Dat	abase',	TMH.							
Refe	rence B	ooks:	• 45	1 .	1 (5	. 1						0000	D .	
1	Navath	eElmasri	ı, "Fui	ndamenta	u of Dat	tabase S	systems".	5th Editi	on, Pears	son Ed	ucatio	n, 2008	. Page	
		4.5 /												

Course C	ode			(Course	Title			Le	cture			
MTCS162	PEP			Dat	a Scier	ence Lab L				Т	Р	Seme	ester: I
Version: 1.2			Date	of Appr	oval: 16	th BoS 17	7-11-2022		0	0	4		
	Scheme	of Inst	ructior	1			Se	cheme of	f Exan	ninatio	on		
No. of I	Periods	: 60	Hrs.					Ma	aximu	n Sco	re	: 100)
Periods	/ Week	: 4						Inter	nal Ev	aluatio	on	: 50	
	Credits	: 2							End S	emest	er	: 50	
Instruction	Instruction Mode : Practical Exam Duration : 3 Hrs.												
Prerequisite	(s): Obje	ect Ori	ented	Datab	ase								
Course Obje	ctives:												
1. To Opti	mize bu	siness	decisio	ns and	create	compet	itive adva	antage v	vith B	ig Dat	ta a	nalytio	cs.
2. To Impa	rt the a	rchited	ctural c	oncept	s of Ha	doop ar	nd introd	ucing m	ap re	duce]	para	adigm.	
3. To Deve	lop Big	Data ap	oplicati	ons for	· strean	ning dat	a using A	pache S	park.				
4. To learn	the Data	a Analyt	ics										
Course Outc	omes (C	O):											
COs No.					Staten	nent				N	Map	ped Pr	ogram
										(Out	comes	(POs)
CO ₁	Unders	tand da	ta sumi	narizati	ion, que	ry, and a	nalysis.]	PO ₁ , P	O_2
CO ₂	Apply d	ata moo	delling t	echniq	ues to la	arge data	a sets				PO	2, PO 7,	PO ₁₂
CO ₃	Creatin	g applic	ations	for Big I	Data an	alytics					F	PO4, P	' O 5
CO ₄	Building	g a com	plete b	usiness	data an	alvtic so	lution]	PO	3, PO 4	, PO 5
PO ₁ - Enginee	ring Kno	wledge,	PO ₂ - 1	Problem	analysis	5, PO ₃ - 1	Design/de	velopmen	t of s	olutio	ns,	PO ₄ - (Conduct
investigations	of compl	ex probl	ems, PO	5- Mode	rn tool ı	isage, PO	6- The eng	ineer and	l societ	y, PO 7	- Én	vironm	ent and
sustainability,	PO 8- Ethi	cs, PO 9-	Individu	al or tea	m work,	PO10- Cor	nmunicatio	on, PO 11- F	Project	manag	geme	ent and	finance,
PO ₁₂ - Life-long	g Learning	g											
		Ma	apping o	of cours	se outco	mes wit	h progran	n outcon	nes				
Course	PO ₁	PO ₂	PO ₃	PO₄	PO ₅	PO ₆	PO ₇	PO ₈	PO	PO) 10	PO 11	PO ₁₂
Outcomes										_			
CO ₁	1	2											
CO ₂		2					3						2
CO ₃			_	2	3		2						
CO ₄			3	2	3								
			1 - 1	Reasond	ıble; 2 –	Signific	ant; 3 – Si	trong					
Detailed Cor	tents:												
1. Form se	tting up	and In	stalling	g Hadoo	op in its	s two op	erating n	nodes: 🛛	Pseu	do dis	strik	outed,	^D fully
distribu	ted.	C . 11	C1 -			1							
2. Impleme	Adding	filog or	ng file	manage	D Dotri	ioving fi	Hadoop:						
1) ii)	Deleting	nies ai r files I	lu ulle Senchr	oark an	d stres	e test a	ies Maache	Hadoo	n chus	ter			
3. Run a ba	asic Wo	rd Cou	nt Mai	Redu	ce pros	fram to	underst	and Mar	Red	ice Pa	arad	digm	🛛 Find
the num	nber of	occur	rences	of ea	ich wo	rd appe	earing in	the in	out fi	le(s)	ΠP	erforn	ning a
MapRed	uce Job	for wo	ord sea	rch cou	int (loo	k for sp	ecific key	ywords	in afil	e) ́			0
4. Stop wo	rd elimi	nation	proble	m:	,	-				,			
5. Input: o	A large	textua	l file co	ontaini	ng one	sentend	ce per lin	e o A sn	nall fi	e con	ntaiı	ning a	set of
stop wo	rds (On	e stop	word p	er line)				_		_	_	_
6. Output:	o A text	ual file	contai	ning th	ie same	senten	ces of the	e large ii	nput f	le wit	thou	ut the	words
appearin	ng in the	e small	file.	41a a 4		.	1.4. 147	4 1		<u>11</u>	. . :	~	
7. Write a	мар кес	auce pr	rogram	that II	dobo	eather C	lata. wea	umer sei	log d	collec	cun whic	g data	every
candida	te for a	nalvsis	with M	ianRed	uce si	nce it is	semi str	unie or uctured	log u land	ata, v re	cor	d-orie	nted
Data	ava	ilable	я	t:	acc, 511	100 10 15	Senn Su	actureu	unu	10		a 010	meeu.
https://	github.	.com/t	omwh	ite/ha	doopbc	ok/tre	e/maste	r/input	/ncd	c/all.			
8. Find ave	rage, m	ax and	min te	empera	ture fo	r each y	vear in N	CDC dat	ta set	?			
9. Filter th	e readii	ngs of a	a set ba	ised or	n value	of the n	neasuren	nent, Oi	itput	the lii	ne o	of inpu	ıt files
associat	ed with	a temp	peratui	evalue	greate	er than 3	30.0 and	store it	in a s	epara	ate	file.	
10. Install a	nd Run I	Pig the	n write	Pig La	tin scri	pts to so	ort, group	o, join, p	roject	, and	filte	er you	r data.
11. Write a	Pig Latir	n script	s for fi	nding T	F-IDF	value for	r book da	taset (A	corpu	is of e	eBoo	oks av	ailable
at: Proje	ct Gute	nberg)	.1				1.	1 1	1	1			
12. Install a	ind Rur	n Hive	then	use Hi	ve to o	create,	alter, an	d drop	data	bases	, ta	ibles,	views,

functions, and indexes.

- 13. Install, Deploy & configure Apache Spark Cluster. Run apache spark applications using Scala.
- 14. Data analytics using Apache Spark on Amazon food dataset, find all the pairs of items frequently reviewed together.
- 15. Write a single Spark application that: o Transposes the original Amazon food dataset, obtaining a PairRDD of the type: \rightarrow o

Counts the frequencies of all the pairs of products reviewed together; o Writes on the output folder all the pairs of products that appear more than once and their frequencies. The pairs of products must be sorted by frequency.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1 E v	Big Data – A Primer, H. Mohanty, P. Bhuyan, D. Chenthati (Eds.), Springer , Studies in Big Data, vol. 11, 2015.
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2 Big Data Analytics with Rand Hadoop, VigneshPrajapati, PACKT Publishing

Reference Books:

1	Mining of Massive Datasets, Jure Leskovec, AnandRajaraman, Jeffrey D. Ullman, Cambridge
	Universities Press, 2012.

2 Big Data at Work: Dispelling the Myths, Uncovering the OpportunitiesBook by Thomas H. Davenpor

Course	Code			(Course	Title			L	ectur	e		
MTCS16	3PEP			Sem	antics V	Web Lab			L	Т	Р	Sem	e ster: I
Version: 1.2			Date	of Appr	oval: 16	th BoS 17	7-11-2022		0	0	4		
	Scheme	of Inst	ruction				S	cheme of	f Exai	mina	tion		
No. of	f Periods	: 60	Hrs.			Maximum Score : 100							
Periods	s/Week	: 4				Internal Evaluation : 50							
	Credits	: 2							End S	Seme	ster	: 50	
Instructio	on Mode	: Pra	ictical					E	xam	Dura	tion	: 31	Hrs.
Prerequisit	e(s) : Sema	ntics W	/eb										
Course Obj	ectives:	1 0		T 1 T 7									
I. To acqu	aint abou	t the Se		Web V	ision.								
2. 10 Unu	erstand at	Jour the	1L, KDF	, KDFS,	OWL.								
3. To Crea	Ontology		ning an	igy. d Miara	te from	Docum	ant to Dat	- Web					
Course Out	comes (C	0	ining an	u Migia		Docum		la WCD.					
COs No.		0).			Statem	nent					Man	ned Pr	ogram
005110					Staten	10110					Out	comes	(POs)
CO ₁	Unders	tanding	about	XML, RI	OF, RDF	S, OWL					P	D_1, PO_2	, PO ₄
CO ₂	Describ	e logic	semant	ics and	inferen	ce with (OWL				P	$\overline{\mathbf{D}_1, \mathbf{PO}_2}$, PO 5
CO ₃	Apply C	uerving	g Ontol	ogy							PC)1, PO 2,	PO ₅ ,
	11.5			0,								PO ₈ , P	O ₉
CO ₄	Create	Web gra	aph pro	cessing	; for var	ious app	lications	such as S	Searcl	h	PO	D 1, PO 5	, PO 8
	engine,	commu	ınity de	tection									
PO1- Engine	ering Kno	wledge,	PO ₂ - F	roblem	analysis	s, PO ₃ - 1	Design/de	velopmen	t of	soluti	ions,	PO ₄ - (Conduct
investigation	s of compl	ex proble	ems, PO	5- Mode	rn tool u	isage, PO	- The eng	ineer and	socie	ety, P	D ₇ - Er	wironm	ent and
	, PO 8- Ethi	CS, PO 9-	Individu	al or tea	m worк, .	PO ₁₀ - Con	nmunicatio	on, PO 11- P	rojeci	t mana	ageme	ent and	finance,
FOI2 LITE IOI	ig Learning	s Ma	nning c	of cours	e outco	mes wit	n nrogran	outcom	าคร				
Course				leouis			i pi ogi un		100				
Outcomes	PO ₁	PO_2	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO	9 I	PO 10	PO ₁₁	PO ₁₂
CO ₁	2	2		2									
CO ₂	3	2			2								
CO ₃	3	2			3			3	2				
CO ₄	3				3			2					
			1 – I	Reasona	ıble; 2 –	Signific	ant; 3 – Si	trong					
Detailed Co	ntents:												
List of exp	perimen	ts:											
1. Working	g with XM	IL,											
2. Working	g with XM	IL Schei	ma, DTI)									
3. Design	Of Ontolo	gy usin	g RDF										
4. Design	RDF docu	ment w	ith diffe	erent Se	erializat	ion form	at (e.g. tu	tle,N-tri	ple)				
5. Design	OI UNTOIO	gy usin	g KDFS										
 Design Case sti 	of Officio	gy usin Ontolo	gOwL										
8 Ouervir	ng Ontolo	on using	ъу SPARC)L									
9. Design	of any do	nain sn	ecific O	< <u>⊷</u> ntoloov	in Prot	tégé							
10. Case St	udy: Dbpe	edia			,								
11. Case st	udv: LOI	D Clou	d										
Examinatio	n and Eva	luation	Patter	n: It inc	clude bo	oth inter	nal evalua	tion (30	mark	s) co	mpris	sing tw	o class
sessional ex	ams/ass	ignmen	ts/ quiz	z/ semi	nar pre	sentatio	n etc. and	external	leval	uatio	n (70	marks) which
is mainly en	d semeste	er exam	ination	•	•						`		
Text Books											-		
1 John D	Davies, Ru	di Stude	er, and l	Paul Wa	rren Jo	hn, "Sem	antic We	b Techno	ologie	es: Tr	ends	and Re	esearch
in Ont	ology-bas	sed Syst	tems", V	Viley an	ıd Son's	, 2006.			-				
2 John I	Davies, Die	eter Fen	isel and	Frank	Van Har	melen, "	Towards	the Sem	antic	Web	: Ont	ology-	Driven
Knowl	edge Mar	lagemei	nt", Johi	n Wiley	and So	ns, 2003							
Reference I	Books:												
1 Found	ation of S	emantio	c Web T	Technol	ogies, P	ascal Hit	zler, Mar	kus and	Sebas	stian			

2	Michael C. Daconta, Leo J. Obrst, and Kevin T. Smith, "The Semantic Web: A Guide to the Future of
	XML, Web Services, and Knowledge Management", Fourth Edition, Wiley Publishing, 2003.

Course Co	de	Course Title Lec								ture			
MTCS231F	ЪЕТ			Blockc	hain Te	chnolog	gy		L	Т Р	Seme	ster: II	
Version: 1.2			Date o	f Appro	oval: 16t	h BoS 17	-11-2022	2	4	0 0			
	Scheme o	of Instr	uction				S	cheme o	of Exan	ninatio	1		
No. of	Periods	: 60	Hrs.					Ма	ximum	Score	:	100	
Periods	/ Week	: 4				Internal Evaluation : 30							
	Credits	: 4				End Semester : 70							
Instructio	n Mode	: Le	cture					Ex	kam Di	iration	:	3 Hrs.	
Prerequisite(s)													
Course Object	ives:	c	6.01			.1 1 4	· ·	111	. 11	1			
1. To underst	and the	functio	n of Blo	ckchaii	n as a m	ethod of	securir	ig distrit	outed le	edgers.			
2. To familiar	ize the n	unction	al/ope	rational	aspect	s of cryp	tocurre	ncy ecos	system	•			
3. To laminar	ize abou	t wallet	s and le	arn the	dr utiliz	ation of	wallet d	uring tra	insacu	011.			
4. To underst		now to	o write a	and app	ny the S	mart Co	ntracts.						
COurse Outcor	nes (CO)	•		6	totomo	nt				Mon	nod Dre	ano m	
COS NO.				5	tateme	ιιι				Out	comes l	(DOg)	
CO.	Apply th	a Block	zehain i	mnlom	ontation	`					\mathbf{D}		
	Apply th	le smar	t contr	acts on	Ethere	ım nlatfı	orm			IC	$\mathbf{p}_1, 1 \in \mathbf{Q}_2, \mathbf{p}_1$	<u>103</u>	
	Apply th			Hyper	ledger		01111.				\mathbf{D}) <u>,</u>	
	Evaluat	$\frac{10}{10}$ the m	aior res	earch (halleng	es and t	echnical	dane ev	isting		\mathbf{D}) <u>,</u>	
CO4	betwee	n theor	ajor res v and n	ractice	in Block	cs and o chain	cennical	gaps cx	isting		101,10	3	
PO ₁ - Engineerir	og Knowl	edge. P	\mathbf{O}_{2} - Pro	blem a	nalvsis.	PO ₃ - De	sign/dev	velopmen	t of so	olutions.	PO₄ - (Conduct	
investigations of	complex	problem	ns, PO 5-	Modern	tool usa	ge, PO 6-	The engi	ineer and	society	, РО 7- Е	nvironm	ent and	
sustainability, PC) 8- Ethics,	PO9-In	dividual	or team	work, PC	010- Comn	nunicatio	n, PO 11- P	roject n	nanagem	ent and	finance,	
PO12- Life-long L	earning												
		Мар	oing of	course	outcom	es with	program	n outcom	nes	1	r	-	
Course	PO ₁	PO ₂	PO ₃	PO₄	PO ₅	PO ₆	PO ₇	POs	PO۹	PO 10	PO ₁₁	PO 12	
Outcomes										- 010			
	3	2	2	0									
				2	2								
<u>CO3</u>				2		2							
CO ₄	3		2			• • •							
Details 1 Conta			1 – Re	asonabl	le; 2 – Si	ignifican	it; 3 – St	rong					
Detailed Conte	ents:	Tradium	1	1 - C		1	1		1	1 C	11		
		Introc	luction	to Cry	ptograp	ny, Intro	oduction	i to grap	oh, ring	g and fie	eld, prii	ne and	
Linite 1		Fuelic	e prin	e num	DEA al	locular	Diffic	Lollmon	mats a	and Eu	iers un	eorem,	
Unit: I		EUCIIC	al Enor	runn,	KSA al	gorium	, Dille	-Hellinal	1 Key A 256 1	exchan	ige alge	oriunn,	
		Know	ledge D	roof (7)	(Emplie KP)	cuive ci	yptogra	ipny, sri	A 230, I	Digital S	ignatui	c, zero	
		Intro	luction	from h	arter sv	stem to	Cryptoc	urrency	funda	mental	of Bloc	kchain	
		Block	struct	ure. Ge	enesis F	Block. O	rphaneo	1 Blocks	. Stale	Block.	Uncle	Block.	
		Distri	buted 1	Ledger	Techno	ology (D	LT). pe	er-to- n	eer n	etwork.	Merkle	e Tree.	
Unit: 2		Lifecy	cle of B	lockch	ain, Evo	lutions of	of Block	chain, Fo	rk, dou	ible spe	nding n	noney,	
		Trans	actions	and U	ГХÓ's, Т	Types of	Blockch	nain. Nee	ed of B	lockcha	in, Ben	efits of	
		Block	chain.			• •							
		Build	the Blo	ckchair	n, Chain	validati	on, Cre	ate the l	Blockcl	hain Ne	twork,	Mining	
		pools,	Minin	g, Diff	iculty 1	Level, C	urrent	Target,	Nonc	e, how	miner	's pick	
Unit: 3 transactions, Work						pools we	ork, 51%	attack. (Conser	isus Alg	orithms	s: Proof	
		of Wo	rk (PoV	V), Asyn	chrono	us Byzar	ntine Ag	reement	, Proof	of Stak	e (PoS),		
		Hybri	d mode	ls (PoW	7 + PoS),	DPoS.							
		Walle	ts, Type	es of wa	llets-Ha	ardware,	Softwa	re, Pape	r, Web	, Deskto	p. Ethe	reum -	
		Ether	eum ne	etwork,	Ethere	um Virt	ual Mac	chine (E	VM), V	Vallets	for Eth	ereum,	
Unit 4		Solidi	ty - Sn	nart Co	ontracts	, Truffle	, Web3	, some a	attacks	on sm	art cor	ntracts,	
		Desig	n and	issue_(Cryptoc	urrency	ICO, N	/ining, (Gas -	Transa	ctional	Fee &	
		Incen	tivisatio	ons, D	Apps, l	Decentra	alized A	Autonom	ous (Organiza	ations	(DAO).	
		Imple	ment th	ne use c	ase of s	upply ch	ain on I	Ethereun	n.				

	Unit: 5	Introduction to Hyperledger, what is Hyperledger, Why Hyperledger, Where can Hyperledger be used, Hyperledger Architecture, Membership, Blockchain, Transaction, Chaincode, Hyperledger Fabric, Features of Hyperledger, Fabric Installation of prerequisite, Architecture of Hyperledger Fabric, Transaction, Ledger, Nodes, Peer, Endorser, Ordering Nodes, Channels, Certificate Authority, Transaction Flow. Implement the use case of supply chain on Hyperledger.											
Exar	amination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class												
sessi	essional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which												
is ma	ainly end semester	examination.											
Text	Books:												
1	Mastering Blockcl	nain, Imran Bashir, Packt Publishing											
2	Bitcoin and Cr	yptocurrency Technologies, Arvind Narayanan, Joseph Bonneau, Edward											
	Felten,Andrew	Miller,Steven Goldfeder, Princeton University Press.											
	https://bitcoinbo	ook.cs.princeton.edu/											
Refe	rence Books:												
1	Grokking Bitcoin,	Kalle Rosenbaum, Manning Publications. <u>http://rosenbaum.se/book/grokking-</u>											
	bitcoin.html												
2	Blockchain Basics	, Daniel Drescher, Apress											
	Publicationhttp://	<u>/vlabs.iitb.ac.in/vlabs-</u> dev/labs/blockchain/labs/index.php											

Course Co	de			C	ourse T	litle			Leo	ture				
MTCS232F	PET	Com	pilers	for Hig	h Perfo	ormance	e Comp	uting	L	ΤP	Seme	ester: II		
Version: 1.2			Date o	f Appro	oval: 16t	h BoS 17	-11-2022	2	4	0 0				
5	Scheme	of Instr	uction	••		Scheme of Examination								
No. of	Periods	: 60	Hrs.			Maximum Score : 100								
Periods	/ Week	: 4 Internal Eval							uation	:	30			
	Credits	: 4 End Sem							nester	:	70			
Instruction	n Mode	: Lee	cture			Exam Duration : 3 Hrs.								
Prerequisite(s)	: Compil	er Desi	gn											
Course Object	ves:													
1. To introdu	ce struct	ture of o	compile	rs and	high-pe	rforman	ce com	piler des	ign.					
2. To underst	and the	Concep	ts of Da	ita Dep	endanc	e in com	pilation	•						
3. To underst	and con	currenc	y analy	sis in tr	anslatic	on.								
4. To underst	and caci	ne cone	rence a	na para	allel looj	os in cor	npilers.							
COurse Outcon	nes (CO)	•		C	totomo	.				Man	nod Dr	- <i>d</i> n - m		
CUS NO.				2	latemen	11					peu Pro	(DOe)		
CO.	Underg	tand no	rallel m	odrama	ming pa	tterns or	nd data	depende	nce		DO, DO	(r.Os)):		
	Analuze	the de	anei pi	devel	ning pa	lel prog	ame	acpende	IIII	D	$1 O_1, PO_2$	ν2 ΡΩ2		
	Analyze	differo	nt nara	llel prov	orammi	ng natto	rns			P	$\mathbf{p}_1, \mathbf{r}_2, \mathbf{p}_2, \mathbf{p}_3$) ₂		
	Fyaluat		ni para	analvei		differen	nt narall	el soluti	one	D	$\mathbf{D}_{2}, \mathbf{P}_{2}$	73 POr		
PO ₄ Engineerir	Evaluat	edre D	$\Omega_{\rm Pro}$	blem a	nalveie		sign /des		t of se	lutions	$\overline{D_2, PO_3,}$	rO ₅		
investigations of	complex	problem	IS. PO5-	Modern	tool usa	ge. PO 6-	The engi	ineer and	society	7. PO 7- F	nvironm	ent and		
sustainability, PC	08- Ethics,	PO ₉ - Inc	lividual	or team	work, PC	0 ₁₀ - Comn	nunicatio	n, PO 11- P	roject n	nanagen	nent and	finance,		
PO12- Life-long L	earning													
		Марр	oing of	course	outcom	es with j	orogram	n outcom	nes					
Course	DO.	DO.	DO.	DO.	DO-	DO.	PO-	DO.	DO.	DO.	DO.	DO.		
Outcomes	101	102	103	104	105	106	107	108	109	1 010	IOn	1012		
CO ₁	3	2												
CO ₂	2	2	3											
CO ₃		2	3											
CO ₄		2	2		3									
			1 – Re	asonabl	e; 2 – Si	gnifican	t; 3 – St	rong						
Detailed Conte	ents:	1												
		High	Perform	nance S	Systems	, Struct	ure of a	a Compi	ler, Pr	ogramn	ning La	nguage		
Unit: 1		Features, Languages for High Performance, Data Dependence: Data Dependence												
		in Loops, Data Dependence in Conditionals, Data Dependence in Parallel Loops,												
		Progra	am Dep	endenc	e Graph] .				the star	- 4 7			
		Scalar	Analys	os with	factor	ea Use-	Def Ch	ains: Co	nstruc	ung Fa	ctored	UseDef		
Unit. 9		Dropo	s, FUD	Unains	IOF AFF	iys, Indu	Dopor	ariables	Using I	rud Ch	allis, Co	ndonco		
Unit. 2		Apoly	gation	MILLI FC	Arrow I	ns, Data	Depen	Dointor	Apoly	ais. Dat	a Depe	ndence		
		Droce	dure Ca	nilays, alle Inte	Allay I	edural A	nalveie	POINCE	Allaly	sis, i/c	Deper	luence,		
		Loop	Restruc	turing.	Simple	Transfe	rmatio		Fusio	n Loor	Fission	Loop		
		Rever	sal Lo	on Inte	rchang	ing Loo	n Skew	zing Lin	ear Lo	n, Loop	ansform	n, Loop		
Unit: 3		Strip-	Mining	Loop	Tiling	Other L	oop Tra	insforma	tions.	and Int	er-pro	cedural		
0111010		Trans	formati	ons. O	ntimizii	ng for	Locality	: Single	Refer	ence to	b Each	Arrav.		
		Multir	ole Refe	rences.	Genera	al Tiling,	Fission	and Fusi	on for	Localit	v.	j,		
		Conci	irrencv	Analys	is: Cond	currency	from S	Sequenti	al Loor	os, Con	currenc	ey from		
		Parallel Loops, Nested Loops, Round off Error, Excentions and Debuggers. Vector												
Unit: 4		Analys	sis: Vec	tor Cod	e, Vecto	or Code f	rom Sec	juential	Loops,	Vector	Code fr	om For		
		all Lo	ops, Ne	ested L	oops, R	ound of	f Error,	Excepti	ons, a	nd Deb	uggers,	Multi-		
		vector	Comp	puters.										
		Messa	ge-Pas	sing M	achines	: SIMD	Machin	es, MIN	1D Ma	chines,	Data	Layout,		
Unit: 5		Parall	el Code	for Arr	ay Assig	nment, i	Remote	Data Ac	cess, A	utomat	ic Data	Layout,		
01110. 5		Multip	ole Arra	iy Assig	nments	, Scalab	le Share	ed-Mem	ory Ma	chines	Global	Cache		
		Coher	ence, L	ocal Ca	ache Co	herence	, Latenc	ey Tolera	ant Ma	chines.	Recent	trends		

	in compiler design for high performance computing and message passing
	machines and scalable shared memory machine.
Exar	mination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class
sess	ional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which
is m	ainly end semester examination.
Text	t Books:
1	Michael Wolfe, High-Performance Compilers for Parallel Computing, Pearson
2	Keith Cooper, Linda Torczon, Engineering: A Compiler, MK Publishers
Refe	erence Books:
1	Robert Robey and Yuliana Zamora, Parallel and High Performance Computing, Manning
	Publications
2	Randy Allen and Ken Kennedy, Optimizing Compilers for modern architectures, MK Publishers

Course Co	de	Course Title Lec								cture			
MTCS233I	PET			Distrib	uted Co	omputing L				T P Semester: II			
Version: 1.2			Date o	of Appro	oval: 16t	h BoS 17	-11-2022	2	4	0 0			
	Scheme o	of Instr	uction				S	cheme o	of Exan	ninatio	n		
No. of	Periods	: 60	Hrs.					Ма	ximum	Score	:	100	
Periods	/ Week	: 4						Intern	al Eval	uation	:	30	
	Credits	: 4				End Semester : 70							
Instructio	n Mode	: Le	cture					Ex	αm Dι	iration	:	3 Hrs.	
Prerequisite(s)	: Artificia	al Intelli	igence										
Course Objecti	ves:	•	<u> </u>	1.	1.1		1.	11 . 11	. 1				
1. To underst	and the	Dasics C	of netwo	orking a	nd the j	protocol	s used if	n distrib	uted e	nvironn	ient.		
2. To evaluate	the imp	act of f	nemory	on par	allel/di	stribute	a algorit	nm forn	iulatio	ns.			
5. To validate	ule peri	of dogic	e of pa	mplom	nstribut	eu algor	iuiiii. ibutod c	laorithn	20				
4. TO gain kind	wiedge	or desig	gn and i	mpieme	entation	i oi uistr	ibuted a	igorium	15.				
COg No	les(CO)	,		C.	totomor	at				Man	nod Dr	odrom	
COS NO.				3	latemen	11				Out	comes	(DOs)	
CO	Analyze	variou		in the	design a	and impl	ementa	tion of		PC	PO_{2}	$\frac{103}{PO_2}$	
001	distribu	ited cor	nnuting	y system	ucsign e is.	ina impi	ementa	.1011 01			, 1 O ₂ ,	103	
CO ₂	Catego	rize the	various	s systen	n model	s. comm	unicatio	on betwe	en	PC)2. PO3.	PO₄	
002	client a	nd serv	er.	b by been	mouer	5, comm	ameativ				2, 2 03,	104	
CO ₃	Apply th	ne knov	vledge o	of deadl	ock met	thods an	d its ale	orithms			PO4. P	D 5	
CO ₄	Unders	tand th	e signif	icance o	of distril	buted fil	e systen	n with re	al	PC	2. PO ₃ .	PO ₆	
	time ap	plicatio	ns.				- J			_	_, _,		
PO1- Engineerin	g Knowl	edge, P	O ₂ - Pro	blem aı	nalysis, 1	PO3- De	sign/dev	elopmen	t of so	olutions,	PO ₄ -	Conduct	
investigations of	complex	problem	IS, PO 5-	Modern	tool usa	ge, PO 6-	The engi	neer and	society	, РО 7- Е	nvironn	nent and	
sustainability, PC	8- Ethics,	PO ₉ - Inc	dividual	or team v	work, PO	10- Comm	nunicatio	n, PO 11- P	roject n	nanagem	ent and	finance,	
PO ₁₂ - Life-long L	earning	Mana											
Course		Mapp	l o o		l	es with j	l	outcon	les	1	1		
Outcomes	PO ₁	PO_2	PO ₃	PO_4	PO ₅	PO_6	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂	
	3	3	3										
	0	3	3	2									
CO ₃		-	-	3	2						1		
CO ₄		2	2	-		2							
		1	1 – Re	asonabl	e: 2 – Si	gnifican	t: 3 – St	rong					
Detailed Conte	ents:				, ,	<u> </u>							
		Intro	luction	Distrit	outed C	Computi	ng Mod	els, Sof	tware	Concer	ots, Ha	rdware	
		Conce	epts, Tł	ne Clien	t Serve	r model	Issues	in desig	n of a	distribu	ited op	erating	
Unit: 1		syster	n. Con	nmunica	ation Ir	ntroduct	ion to	Message	e Pass	ing, Ad	lvantag	es and	
Offic. I		featur	es of	messag	e passi	ng, Mes	ssage fo	ormat, M	Messag	e Buffe	ering, 1	Remote	
		Proce	dure C	'all, Ext	ended	RPC Mo	odels, R	emote (Object	Invoca	tion, N	lessage	
		Orien	ted Cor	nmunic	ation.								
		Proce	sses An	ld Syncl	ironizat	tion Thre	eads, co	de migra	ation, c	lock sy	nchron	ization,	
Unit: 2		logica	l clock	s, globa	l state,	Election	n algorit	hms, m	utual e	exclusio	n, Dist	ributed	
		transa	action.	- 11	1.0.4			11.0				• .•	
		Distri	buted I		k Detec	ction Sy	stem m	odel, Re	source	es vs. co	ommur	lication	
Unit: 3 deadlocks, deadlock p						vention,	avoid	ance, (on an	a res	olution,	
Centralized deadlock dete						tion, as	stribute	i deadic	ock de	lection,	paul j	Jushing	
		Distri	buted 9	Shared	Memor	v Introd	uction	Conoral	archit	octura	of dist	ributed	
Distributed Shared Memory						nd imp	lements	tion Is		of DSM	Gran	ularity	
Unit: 4		struct	ure of a	shared r	nemorv	snace o	onsiste	nev mod	els th	rashing	advant	ages of	
		DSM		niai cu I	iiciii0i y	space, (.51151510	ncy mou	.c.s, ull	usining,	auvail	uges of	
		Distri	buted F	ile Syst	em Intr	oduction	n. Desire	able feat	ures o	fgood	listrihu	ited file	
Unit: 5		syster	n. file n	nodels f	ile acce	ssing sh	aring c	aching m	nethod	s. file re	plicatio	on, fault	
		tolera	nce, Ca	ise Stud	y: CORI	BA (COR	BA RMI	and Serv	vices)	-,	1	-,	

Exa	mination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class
sess	ional exams/assignments/quiz/seminar presentation etc. and external evaluation (70 marks) which
is m	ainly end semester examination.
Text	t Books:
1	Dr. Nilakshi Jain, Dr. Dhanajay R. Kalbande
2	Richard Boddington, Practical Digital Forensics, PACKT publishing, First Edition, 2016 ANDRÉ
	ÅRNES.
Refe	erence Books:
1	Practical Mobile Forensics, PACKT publishing , 2014 Satish Bommisetty, Rohit Tamma, Heather
	Mahalik
2	"Guide to Computer Forensics and Investigations" 4e, Nelson, Phillips Enfinger, Steuart, Cengage
	Learning.

Course Co	de	Course Title Lectu								ture Semeste		
MTCS2341	PET .		Na Data a	tural L	anguage	e Proce	ssing _11_202)		T P		II
version. 1.2	Scheme	of Instr	Date C	л аррго	Jval. 101	11 005 17	-11-2022 S	cheme c	4 f Fyami	nation		
No of	Periods	\cdot 60	Hrs				2	<u>M</u>	laximum	Score	•	100
Periods	/ Week	: 4	/ 1115.			Internal Evaluation : 30						30
	Credits	: 4	4 End Ser								:	70
Instructio	n Mode	: Le	cture]	Exam Du	iration	:	3 Hrs.
Prerequisite(s)	: Compu	ter Pro	grammi	ing and	Databas	se						
Course Objecti	ves:											
1. To underst	and natu	ral lan	guage p	rocessi	ng and							
2. To learn ho	ow to app	oly basi	c algori	thms in	this fiel	ld of NL	Ρ.					
3. To get acq	uainted v	vith the	e algorit	hmic de	escriptio	on of the	e main la	inguage	levels: m	orpholo	ogy, s	syntax,
 semantics, and pragmatics, as well as the resources of natural language data - corpora. To conceive basics of knowledge representation, inference, and relations to the artificial intelligence. 												
4. To conceiv	e basics		viedge i	eprese	ntation,	interen	e, and r	elations	to the a	runcial	inter	ligence.
COs No	les(CO).				Stateme	ont				Mann	od D	rodram
COS NO.				•	Stateme	iiit				Oute	ome	s (POs)
CO ₁	Unders	tand na	atural la	nguage	process	sing and	learn h	ow to ap	plv	P	O_1 . F	$\frac{3(100)}{10^2}$
	basic al	gorithr	ns in th	is field.	process	ung unu	iourir ii	on to up	P-J	-	01, -	02
CO ₂	Unders	tand th	e algori	thmic d	lescripti	ion of th	e main l	anguage	levels:	PO ₄	, PO	5, PO 8
	morpho	ology, s	yntax, s	emanti	cs, and p	oragmat	ics, as w	ell as the	е			
	resourc	es of n	atural la	anguage	e proces	sing.						
CO ₃	Analyze	langua	age mod	lelling a	ind sequ	ience ta	gging.			PO ₂ , PO ₄ , PO ₆ ,		
										P	07, F	08
CO ₄	Unders	tand th	e desig	n featur	es of in	formatic	on retrie	val syste	ems	PO ₁	, PO ₃	, PO ₆ ,
DO En rin e enir	et Verseel	- Jaco T	D D ===	1 -1	1	DO D-	-:	-1	f 1-	tion of D	PO ₁	2 Construct
investigations of	complex	problen	NG POr-	Modern	tool usa	rus- De de POs-	sign/dev The engi	neer and	society l	PO_{7-} Env	04- ironn	conduct
sustainability, PC	0_8 - Ethics,	PO ₉ - In	dividual	or team	work, PO	ge, 10 0 10- Comn	nunicatio	n, PO 11- P	roject ma	nagemen	it and	finance,
PO12- Life-long L	earning									-		
		Map	ping of o	course	outcom	es with J	program	outcom	es	1		
Course	PO ₁	PO ₂	PO ₃	PO_4	PO ₅	PO_6	PO ₇	PO ₈	PO ₉	PO ₁₀	РО	PO
Outcomes	2	2										12
	3	2		2		1		2				
		2		1		2	2	2				
CO4	2	4	3	1		2						2
004	-		1 – Re	asonabl	e: 2 – Si	 anifican	t: 3 – St	rona				-
Detailed Conte	ents:				, <u> </u>	<u>g</u> <u>j</u>	,	. ong				
		Intro	duction	: Introc	luction	to the N	Iorpholo	ogy, Synt	ax, Sem	antics b	y linl	king the
Unit: 1		"lingu	istics v	iew" (co	mputat	ional ling	guistics)	with the	e "artifici	al intelli	igeno	ce view"
		(natu	ral lang	uage pr	ocessing	g).	- ,				-	
		Morp	hology:	Analys	is and g	generati	on of lai	nguage o	on word	level: e.	g. pi	oblems
		with	compou	inding a	and idio	matic pl	nrases, ł	nomopho	onous st	rings as	well	as loan
Unit: 2		word	s and th	ieir pro	cessing	using e	.g. finite	state au	itomata	as well	as se	emantic
		netw	orks. An	nbiguiti	es in wo	ords like	"pen" a	nd "pipe	", but wi	ill also d	ISCU	ss some
		Comp	nex stri	iigs.	danara	tion of	longuag	o on phr	acal and	conton	00.10	walt a d
		appli	ations	such	i genera	hine tra	nelation	and o	asai allu rammar	checki	nd a	nd the
Unit 3 processing using phase structure								nars as	well a	s unific	ation	n-based
		forma	alisms a	and rel	ating th	nose for	malisms	s to rec	ursive t	ransitio	n ne	etworks
	(RTNs) as well as augmented transition networks (ATNs).											
		Sema	ntics: L	anguag	e ambig	uities or	n the lev	el of "me	eaning":	represe	nted	by case
		struc	tures a	nd con	ceptual	depend	lency s	tructure	s. We v	vill look	at	famous
Unit: 4		utter	ances s	uch as:	Colorle	ss green	ideas s	leep fur	iously. A	nd will	discu	iss why
		the m	nachine	runs in	to probl	ems dur	ing anal	ysis, and	how the	ese prob	lems	s can be
1		overc	come.									

	Unit: 5	Applications of NLP: Machine Translation, Grammar Checkers Dictation,											
	Onic. 5	Automatic Document Generation, NL Interfaces.											
Exar	Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class												
sess	sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which												
is m	mainly end semester examination.												
Text	t Books:												
1	Daniel Jurafsky, Ja	mes H. Martin "Speech and Language Processing" Second Edition, Prentice Hall,											
	2008.												
2	Chris Manning and	d Hinrich Schütze, "Foundations of Statistical Natural Language Processing", MIT											
	Press. Cambridge,	MA: May 1999.											
Refe	erence Books:												
1	Allen, James, Nat	ural Language Understanding, Second Edition, Benjamin/Cumming, 1995.											
2	Charniack, Euge	ne, Statistical Language Learning, MIT Press, 1993.											

Course Cod	le	Course Title								Lecture			
MTCS235PI	ET			Quantı	um Cor	nputing	ŗ	Т Р	Seme	ster: II			
Version: 1.2			Date of	f Approv	v al: 16tł	n BoS 17-	11-2022		4	0 0			
S	cheme o	of Instru	uction				S	cheme	of Exan	ninatio	n		
No. of F	Periods	: 60	Hrs.					Ma	aximum	Score	:	100	
Periods/	/ Week	: 4						Inter	nal Eval	uation	:	30	
(Credits	: 4							End Sei	mester	:	70	
Instruction	n Mode	: Lee	cture		1. ·			E	xam Di	iration	:	3 Hrs.	
Prerequisite(s):	Artificia	il Intelli	gence a	ind Mac	hine Le	earning							
1 To understa	atum or	montor	c and hi	abliabt	tho par	adiam	abanga						
hetween co	nventior	al com	nuting	and qua	ntum c	omputer	s anu m or	gilligitt	the pai	auigini	liange		
2. To understa	nd enta	ngled a	uantum	n subsvs	tems ar	nd prope	erties of	entang	led stat	es			
3. To understa	nd the (Duantui	n state	transfo	rmatior	is and th	ne algori	ithms.	ieu stat				
4. To explore the applications of quantum computing.													
Course Outcom	es (CO):				1	0							
COs No.	,/			St	atemer	nt				Мар	ped Pro	ogram	
										Out	comes	(POs)	
CO ₁	Unders	tand the	e basic	principl	es of qı	iantum o	computi	ng.			PO ₁ , PC)3	
CO ₂	Analyze	the kn	owledg	e of the	fundan	nental di	fference	es		PO	D ₁ , PO ₂ ,	PO ₉	
	betwee	n conve	ntional	compu	ting an	d quantu	im com	puting.					
CO ₃	Apply s	everal b	asic qu	antum o	comput	ing algoı	rithms.			PC	$\mathbf{D}_2, \mathbf{PO}_3,$	PO ₄	
CO ₄	Analyze	e the cla	sses of	probler	ns that	can be e	expected	d to be	solved	PO ₁ ,	PO_2, PO	3, PO 4,	
	well by	quantu	m com	outers.			1				PO ₅	~ 1	
PO ₁ - Engineering	g Knowle	edge, P	D ₂ - Pro	blem an	alysis, l	PO_3 - Des	sign/dev	elopmer	nt of so	olutions,	PO ₄ - (Conduct	
sustainability PO	- Ethics	PO Ind	s, PO5-1 lividual d	viouern i	tool usag	ge, PO 6-	i ne engi	neer and n PO 1	1 society Project n	, PO 7- E	nvironiii ent and	finance	
PO ₁₂ - Life-long Le	arning	r Og mid	lividual (01K, PO		unicatio	n, ro n 1	rojectii	lanagen		iniance,	
		Марр	ing of c	course o	utcome	es with r	program	outcor	nes				
Course	DO			DO	DO			DO	DO	DO	DO	DO	
Outcomes	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂	
CO ₁	3		2										
CO ₂	3	2							2				
CO ₃		3	3	1									
CO ₄	3	3	3	2	2								
			1 – Rea	isonable	; 2 – Si	gnifican	t; 3 – St	rong					
Detailed Conter	nts:												
		Qubit	& Qua	intum S	states: '	The Qub	oit, Vec	tor Spa	ices. Lii	near Co	ombinat	tion Of	
Unit: 1		Vecto	rs, Uni	queness	sofas	spanning	g set, b	asis &	dimens	ions, ir	iner Pro	oducts,	
		ortho	normali	ty, gra	m- scl	hmidt c	orthogo	nalizatio	on, bra	i-ket f	ormalis	m, the	
		Cauch	iy-schw	varez an	id trian	gle Inequ	ualities.	l' O		0	Duri	ta mila a	
		Class	ces & C	perator	s: Obse	ervables,	, The Pa	uli Ope	erators,	Outer	Produc	ts, The	
		motrix		JOII, Kej	present	ation of	operati	on of o	g matri	ces, ou	o dime	neional	
Unit: 2		space	s Pauli	Matrix	Herm	itian un	itary an	d norm	perator	s III tw rator F	ligen va	alues &	
01111. 2		Eigen	Vecto	rs Sne	, πerm ctral Γ)ecompo	nary an	Trace	of an	operat	or im	ortant	
		prope	rties of	Trace. I	Expecta	tion Valu	ue of Or	erator.	Project	ion Ope	erator. I	Positive	
		Opera	tors.	11400,1	inp c c t d	ulon van		erator,	roject	ion op.		0010110	
		Comn	nutator	Algebra	, Heise	nberg u	ncertair	nty prin	ciple, p	olar de	compos	sition &	
Unit: 3		singul	ar valu	es, Posti	ulates o	of Quanti	um Mec	hanics.	. '1		1		
		Tenso	r Prod	ucts: R	eprese	nting C	omposit	te Stat	es in (Quantu	m Mec	hanics,	
		Comp	uting ii	nner pro	oducts,	Tensor	product	ts of co	lumn v	ectors,	operate	ors and	
Unit: 4		tensor products of Matrices. Density Operator: Density Operator of Pure & Mix											
		state, Key Properties, Characterizing Mixed State, Practical Trace & Reduce											
		Densi	ty Oper	ator, De	ensity C	ty Operator & Bloch Vector.							
		Quant	um Me	easurem	ent Th	eory: D	istingui	shing C	Quantun	n state	s & Me	asures,	
Unit: 5		Projec	tive M	easuren	nents, 1	Measure	ement o	n Com	posite	system	s, Gene	eralized	
		Measu	ıremen	ts, Posit	ive Ope	erator- V	/alued N	/leasure	es. Rece	nt tren	ds in Qı	ıantum	

		Computing	Research.	Ouantum	Computing	Applications	of	Genetic
		Programmin	g.		1 8	II		
Exa	mination and Evalu	ation Pattern:	It include b	oth internal	evaluation (30	marks) compri	sing	two class
sess	ional exams/ assign	ments/ quiz/	seminar pre	esentation et	c. and externa	l evaluation (70	mar	ks) which
is m	ainly end semester	examination.						
Text	t Books:							
1	Quantum Compu	iting without	Magic by Z	Zdzislaw Me	eglicki			
2	Quantum Compu	iting Explain	ed By DAVI	D Mc MAH	ŌN			
Refe	erence Books:		-					
1	Quantum Compu	iter Science	By Marco L	anzagorta,	Jeffrey Uhlm	ann		
2	An Introduction	to Ouantum	Computing	Phillip Kay	e. Ravmond I	aflamme. Mic	hele	Mosca.

Course Co	de	Course Title								Lecture				
MTCS241P	ET		Ad	vanced	Opera	ting Sys	stem		T P Semester: II					
Version: 1.2		Date of Approval: 16th BoS 17-11-2022 4							4	0 0				
S	cheme o	of Instruction Scheme of Exam								ninatio	n			
No. of I	Periods	: 60	Hrs.			Maximum Score : 100								
Periods	/ Week	: 4 Internal Evalu								uation	:	30		
	Credits	: 4	End Semester									70		
Instruction	n Mode	: Lee	cture					Ех	am Du	ration	:	3 Hrs.		
Prerequisite(s):	Operat	ing Sys	stem											
Lourse Objectiv	ves:	loco of th	o moin		nonta o	fOgand	l thain w	onling						
1. To provide	kilowieu	ige of the	of proc	compo	l thread	and the	ir sched	orking.	licios					
2. To impart k	nowledg	ncepts re of Ha	ndling	synchro	nizatio	n of con	n scheu	nrocess	es and	deadlo	cks			
4. To Analyze the different techniques for managing memory. I/O. disk and files.														
Course Outcomes (CO):														
COs No.	()			St	tatemer	nt				Мар	ped Pro	gram		
										Out	comes (POs)		
CO ₁	Unders	tand the	e gener	al archi	tecture	of comp	outer sys	stem.		PO	P ₂ , PO ₃ , P	PO ₄		
CO ₂	Unders	tand, c	contras	t and	compa	re diffe	ring st	ructure	s for	PO ₁ , I	PO2, PO	6, PO 8,		
	operati	ng syste	ems.								PO ₉			
CO ₃	Gain pr	oficienc	y need	ed to ar	halyze tl	heory an	id imple	mentati	on of:	PO ₁ , I	PO_2, PO_2	3, PO5,		
<u> </u>	process	ses, sche	eduling	<u>, 1/0 ar</u>	nd files s	systems.			T *		PO_7, PO_7	12		
CO_4	Analyze	e variou	s types	or oper	rating s	ystems 1		g Unix/	Linux		PO_2, PO	3		
	operati	na svste	ms	KIIOWIE	ige of	memor	y man	agemen	t IOI					
PO ₁ - Engineering	v Knowle	edge. P	\mathbf{D}_{2} - Pro	blem ar	alvsis. 1	PO ₃ - De	sign/dev	elopmen	t of so	olutions.	PO₄ - (Conduct		
investigations of	complex	problem	s, PO ₅ - 1	Modern	tool usa	ge, PO 6- '	The engi	neer and	society	, РО 7- Е	nvironm	ent and		
sustainability, PO	s- Ethics,	PO9- Ind	lividual o	or team v	vork, PO	10- Comm	unicatio	n, PO 11- P	roject n	nanagem	ent and i	finance,		
PO ₁₂ - Life-long Le	earning													
0	1	Марр	ing of c	course o	outcome	es with p	program	outcom	les			r		
Outcomes	PO_1	PO ₂	PO_3	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂		
CO ₁		3	3	2										
CO ₂	3	2	0			3		2	2					
CO ₃	2	3	3		2							2		
CO ₄		2	3											
			1 – Red	asonable	e; 2 – Si	gnifican	t; 3 – St	rong						
Detailed Conter	nts:							0						
		Introd	luction	: Operat	ting syst	tem cono	cept - pi	ocesses	and th	reads, p	process	model,		
Unit 1		proce	ss crea	tion, pr	ocess te	erminati	on, proc	ess hier	archie	s, and p	process	states,		
Office 1		Imple	mentat	ion of	proce	esses, 7	hreads	- Threa	ad mo	odel, t	hread	usage,		
		Imple	mentat	ion of tl	hreads i	n user s	pace an	d kernel	, Hybri	d imple	mentati	ions		
		Inter	Proces	ss Con	nmunica	ation: R	ace co	nditions	s, criti	cal reg	gions, 1	Mutual		
Unit: 2		Exclus	sion wit	th busy	waiting	, sieep ai	nd wake	up, sem	apnore	s, Mute	xes, Mo	nitors,		
		Ressa Roal ti	ige pas	sing; SC	heauin brood a	g: scheu chodulir	unng m va	batch s	ystems	s, intera	cuve sy	stems,		
		Deadl	ocks:	Introdu	ction	Deadloc	ig. k Dete	ction a	nd Re	ecoverv	– De	adlock		
Unit 3		Detec	tion wi	th one	resourc	e of eac	h type y	with mu	ltinle r	esource	of eac	h type		
01110. 5	recovery from deadlock						voidanc	e. Dead	lock Pr	eventio	n.	n type,		
		Memo	emory and Device Management: Introduction Swapping Paging Virtual											
		memo	iemory – Demand paging, page replacement Algorithms; File System											
Unit: 4		Management- Organization of File System, File Permissions, MS DOS and UNIX												
		file system case studies, NTFS; Device Management- I/O Channels, Interrupts												
		and Interrupt Handling, Types of device allocation.												
		Distri	outed	Operat	rating Systems: Distributed operating system concept -									
Unit: 5		Archit	ecture	s of Dist	tributed	l System	s, Distri	buted M	lutual I	Exclusic	on, Distr	ibuted		
01110. 5		Deadl	ock de	etection	, Agree	ement j	protoco	ls, Thre	eads, I	process	or Allo	cation,		
		Alloca	tion al	gorithm	ns , Dis	tributed	File sys	tem des	sign; Re	eal Time	9			

	Operating Systems: Introduction to Real Time Operating Systems, Concepts of scheduling Real time Memory Management.
Exar	mination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class
sess	ional exams/assignments/quiz/seminar presentation etc. and external evaluation (70 marks) which
is m	ainly end semester examination.
Text	t Books:
1	MukeshSinghal and Niranjan, "Advanced Concepts in Operating Systems", TMH, 1st
	Edition, 2001.
2	Andrew S. Tanenbaum, "Modern Operating Systems", Pearson Education, 2nd Edition,
	2006
Refe	erence Books:
1	Andrew S. Tanenbaum, "Distributed Operating Systems", Pearson Education, 2ndEdition, 2001.
2	Pradeep K. Sinha, "Distributed Operating Systems and concepts", PHI, First Edition, 2002

Course Co	de			С	ourse T	'itle			Leo	cture			
MTCS242F	PET		Γ	Digital I	mage I	Processi	ng		L	ТР	Seme	ster: II	
Version: 1.2			Date o	f Appro	val: 16t	h BoS 17	-11-2022	2	4	0 0			
	Scheme o	of Instr	uction				S	cheme o	of Exar	ninatio	n		
No. of	Periods	: 60	Hrs.			Maximum Score : 100							
Periods	/ Week	: 4 Internal Evalu								uation	:	30	
	Credits	: 4						F	End Sei	nester	:	70	
Instructio	n Mode	: Le	cture					Ех	kam Du	iration	:	3 Hrs.	
Prerequisite(s)	: Machin	e Learn	ing										
Course Objecti	ves:												
1. To study th	ie image	fundam	entals a	and mat	hemati	cal trans	sforms n	ecessar	y for in	nage pr	ocessin	g.	
2. To Underst	and imag	ge resto	ration a	and ima	ge com	pression	n proced	lures.					
3. To Analyze	and iden	tify diff	erent f	eature e	extraction	on techr	niques fo	or image	analys	sis and r	recogni	tion.	
4. To introduce segmentation and morphological processing techniques.													
Course Outcon	nes (CO):			-									
COs No. Statem						nt				Map Out	ped Pro comes (ogram (POs)	
CO ₁	Unders	tand t	he bas	sics of	image	e proce	essing	enhance	ment	PC	D ₁ , PO ₄ ,	PO_6	
	techniq	ues su	ch as I	mage f	ormatio	n and t	ransfor	mation	using				
	samplin	ig and c	uantiza	tion.									
CO ₂ Apply the mathematical modellin compression techniques.						of ir	nage re	storatio	n and	PO ₂ ,	PO ₃ , PC	D ₄ , PO ₅	
CO ₃	CO ₃ Compression techniques:						oy image	9		PC	D ₁ , PO ₃ ,	PO ₄	
CO4	Analyze	and a	only co	mnress	ion and	coding	technic	11165 1156	d for	PO	PO2	PO ₁₂	
004	Image of	lata	pry co	mpress.		counig	teenine	lucs use	u ioi	10	2,103,1	012	
sustainability, PO PO 12- Life-long L	8- Ethics, earning	PO ₉ - Ind Mapp	ividual c	or team v	vork, PO	₀- Comm	unication program	n, PO 11- P	roject n	nanagem	ent and	finance,	
Course						F							
Outcomes	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO_6	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂	
CO ₁	2			1		1							
CO ₂		2	3	2	2	2							
CO ₃	3		3	2									
CO ₄		3	3									1	
			1 - Rea	– Reasonable; 2 – Significant; 3 – Strong									
Detailed Conte	nts:												
		Intro	luction	to Imag	e Proce	ssing: In	nage for	mation,	image	geomet	ry pers	pective	
Unit: 1		and o	ther tra	insform	ation, s	tereo im	naging e	lements	of visu	ial perc	eption.	Digital	
		Image	e-sampl	ing and	quantiz	zation se	erial & p	arallel Ir	nage p	rocessi	ng.		
		Signal	Proces	ssing: Si	gnal Pr	ocessing	g - Four	ier, Wals	sh-Hac	lmard d	liscrete	cosine	
		and	Hotellir	ng trar	sforms	and t	heir pi	ropertie	s, filte	ers, co	rrelator	rs and	
Unit: 2		convo	lvers.	Imag	e enl	nanceme	ent-Con	trast	modif	ication,	His	togram	
		specif	ication	, smoot	hing, sh	arpenin	g, frequ	ency doi	main e	nhancei	ment, p	seudo-	
		colou	r					-					
		Image	Rest	oration	: Imag	e Rest	oration	-Constra	ained	and	uncons	trained	
LL.'. O		restor	restoration Wiener filter, motion blur remover, geometric and radiometric										
Unit: 3		correction Image data compression-Huffman and other codes transform											
		compression, predictive compression two tone Image compression, block											
		Sorm	Segmentation Techniques: Segmentation Techniques-thresh holding										
		approaches region growing relayation line and edge detection approaches											
Unit: 4		edge	linking	superv	ised an	d insur	ervised	classifi	cage u	technic	n appit	motely	
		sense	d image	analve	is and a	nnlicatio	ons	CIGSSIIN	cation	cenne		motery	
		Shape	Analvo	sis: Sha	ne Ana	$v_{sis} - c$	Gestalt	principle	es, sha	ne nur	nber m	oment	
Unit: 5		Fourie	er and	other	shape	descript	ors, Sk	elton de	etectio	n, Hou	gh trar	nsform,	

	topological and texture analysis, shape matching. Practical Applications – Finger print classification, signature verification, text recognition, map understanding,
	bio-logical cell classification.
Exa	nination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class
sess	ional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which
is m	ainly end semester examination.
Text	Books:
1	Gonzalez and Wood, "Digital Image Processing", Addison Wesley, 1993.
2	Anil K.Jain, "Fundamental of Image Processing", Prentice Hall of India.
Refe	rence Books:
1	Rosenfeld and Kak, "Digital Picture Processing" vol.I&vol.II, Academic,1982
2	Ballard and Brown, "Computer Vision", Prentice Hall, 1982

Course Co	ode		Course Title Lect									
MTCS243I	РЕТ		Advanc	ced Wire	eless & l	Mobile N	Vetwork	s	L	ΤF	Seme	ester: II
Version: 1.2			Date o	f Appro	val: 16tl	h BoS 17	-11-2022	2	4	0 0)	
	Scheme o	of Instruction Scheme of Exam								ninatio	on	
No. of	Periods	: 60	Hrs.					Ма	ximun	n Score	:	100
Periods	/ Week	: 4						Intern	al Eva	luation	:	30
	Credits	: 4	: 4 End Se								:	70
Instructio	n Mode	: Le	cture					Ex	kam Di	uration	:	3 Hrs.
Prerequisite(s	: Mathen	natics										
1 To Unders	ves.	ot and t	ho futur	o noods	and che	llonge	C.					
2. To acquaint with key concepts of wireless networks, standards, tech operations.										ogies a	nd thei	r basic
 To analyze and design various medium access. To demonstrate the applications. 												
4. To demonstrate the applications.												
COs No.				St	atemer	nt				Mar	pped Pro	ogram
0001101										Ou	tcomes	(POs)
CO ₁	Apply a	dvance	d know	ledge of	networ	king and	d wireles	s netwo	rking	P	O ₁ , PO ₂ ,	PO ₆
	and un	derstar	nd vario	ous type	es of w	ireless	network	s, stand	lards,			
	operati	ons and	l use Ca	ises								
CO ₂	Analyze under l	e and d ying pr	lesign V opagati	VLAN, V on and I	VPAN, ` oerform	WWAN, ance an	Cellula alysis.	r based	upon	PO ₁ ,	PO 3, P O)4, PO9
CO ₃	Create	and	Design	wirele	ss net	works	explorin	g trade	e-offs	PC) 3, PO4 ,	PO ₁₀
CO	Analyze	and de	evelop n	nobile a	nnlicati	ons to se	olve son	ne of the	real-	P)₂ PO₅	PO12
004	world p	roblem	is.	lioone u	ppnear	0115 00 5	0170 5011		icui		53, 1 03,	1 012
 PO₁- Engineerir investigations of sustainability, PC PO₁₂- Life-long L 	g Knowle complex 0 ₈ - Ethics, earning	edge, P problem PO 9- Inc	O ₂ - Pro s, PO ₅ - 1 lividual o	blem an Modern t or team w	alysis, I tool usag vork, PO 1	PO_3 - Des ge, PO_6 - ' $_{10}$ - Comm	sign/dev The engi iunicatio	elopmen neer and n, PO ₁₁ - P	t of society	olutions 7, PO 7- 1 nanager	, PO₄- Environm nent and	Conduct ient and finance,
Course		мар		course d	butcome	es with p	brogram	outcom	les		T	
Outcomes	PO ₁	PO_2	PO_3	PO_4	PO ₅	PO_6	\mathbf{PO}_7	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂
CO ₁	1	1				2						
CO ₂	2		1	2					2			
CO ₃			1	2						2		
CO ₄			2		2							1
			1 – Rec	isonable	e; 2 – Sig	gnifican	t; 3 – St	rong				
Detailed Conte	ents:											
Introduction: Wireless M Concepts, Multiple Acco Spectrum technologies, I Challenges in Mobile Cor Unit: 1 Wireless Local Area Netwo 802.11 MAC Modes (DCF & Infrastructure vs. Adhoc M Problem, Problems, Fadi						etworkin s Tech equency puting: I ks: IEEE CF) IEEI odes, Hic g Effect	ng Tren nologies reuse, Resource 802.11 V E 802.11 Iden No s in In	ds, Key Radio l e poorn Vireless standard ode & Ex door an	y Wir IA, FI Propag ess, B LANs ds, Arc posed nd out	eless 1 DMA, 7 gation a andwid Physica hitectu Termin door V	Physical FDMA, and Mo th, ener al & MA re & pro nal WLANs,	Layer Spread delling, gy etc. C layer, otocols, WLAN
Unit: 2 Unit: 3	lular Ne ver Win gnment proving s. sical lay less Re	etworks: reless N t strate coverag ver, Meo gional	orks: 1G and 2G, 2.5G, 3G, and 4G, Mobile IPv4, Mobile ess Networks, Cellular architecture, Frequency reuse, trategies, Handoff strategies, Interference and system verage and capacity in cellular systems, Spread spectrum , Media access control, Mobility and Networking), IEEE onal Area Networks, IEEE 802.21 Media Independent									
		Hand Physi	over C cal, MA	verview C layer a	7 Wirel and Net	ess Ser work La	nsor Ne Iyer, Pov	etworks: ver Man	intro ageme	auctio: ent, Tin	n, Appl y OS Ov	ication, erview.

		Wireless PANs: Bluetooth AND Zigbee, Introduction to Wireless Sensors.									
	Unit: 4	Security: Security in wireless Networks Vulnerabilities, Security techniques, Wi-									
		Fi Security, DoS in wireless communication.									
Advanced Topics: IEEE 802.11x and IEEE 802.11i standards, Introduct											
	Unit. 3	Vehicular Adhoc Networks, Opportunistic Networks.									
Exa	mination and Evalua	ation Pattern: It include both internal evaluation (30 marks) comprising two class									
sess	ional exams/ assign	ments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which									
is m	ainly end semester of	examination.									
Text	t Books:										
1	Schiller J., Mobile	Communications, Addison Wesley 2000.									
2	Stallings W., Wirel	ess Communications and Networks, Pearson Education 2005.									
Refe	erence Books:										
1	Stojmenic Ivan, Ha	ndbook of Wireless Networks and Mobile Computing, John Wiley and Sons Inc									
	2002.										
2	Yi Bing Lin and Im	rich Chlamtac, Wireless and Mobile Network Architectures, John Wiley and Sons									
	Inc 2000.										

Course Co	de	Course Title Le									ecture		
MTCS244F	РЕТ		Mobi	le Appl	ication	s and Se	ervices		L	Т Р	Seme	ster: II	
Version: 1.2			Date o	f Appro	val: 16t	h BoS 17	-11-2022	2	4	0 0			
	Scheme o	of Instr	uction				S	cheme o	of Exa	minatio	n		
No. of	Periods	: 60	Hrs.					Ма	ximun	n Score	:	100	
Periods	/ Week	: 4						Intern	al Eva	luation	:	30	
In atoms at in	Credits	: 4	- 4					E E	End Se	mester	:	70	
Instructio Dronoguigito(g)	n Mode	: Le	cture					EΣ	am D	uration	:	3 Hrs.	
Course Objecti	ves	lei neu	VOLKS										
1 To introdu	ice soft	compu	ting co	oncents	and to	echnique	es and	foster	their	abilities	in de	signing	
appropriate	e technia	ue for a	given	scenario).	connqu	co una	loster	unen	abilitie	, in ue	51 <u>9</u> 11119	
2. To impleme	ent soft c	omputi	ng-bas	ed solut	tions for	r real-w	orld pro	blems.					
3. To give stu	litional	technol	ogies ar	nd funda	ament	als of a	rtificial	neural					
networks, f	algorith	ms.	-										
4. To provide	student	hands-	on expe	erience	on MAT	'LAB to i	mpleme	nt vario	us stra	tegies.			
Course Outcon	nes (CO):												
COs No.				St	atemer	nt				Map Out	ped Pro	ogram (POs)	
CO ₁	Unders Platforr	tand th ns inclu	e funda Iding iC	amental DS, Andr	s, frame oid, and	eworks, o d Phone	of mobil Gap.	e applic	ation	PC	D ₁ , PO ₂ , 1	PO ₁₀	
CO ₂	Analyze sketch	the ta	rget pla	atform a	and use	rs and t	be able 1	to define	e and	PO	D ₃ , PO ₄ ,	PO ₅	
CO ₃	Analyze	e, Design	n and d	evelop a	n mobile	e applica	tion pro	totype i	n one	PO ₃ ,	PO ₅ , PC	9, PO ₁₁	
CO	Analyze		is (chan	d Imp	lement	app development lifecycle PO₃, PO₄, PO₅, I							
004	includir	or Arch	itecture	e Design	n Testir	app ut og Secui	rity and	Hacking	s	FO3,	PO ₁₂	5, FO6,	
PO ₁ - Engineerin	g Knowle	edge, P	D ₂ - Pro	blem an	alysis, 1	PO ₃ - Des	sign/dev	elopmen	t of s	olutions.	PO ₄ - (Conduct	
investigations of	complex]	problem	s, PO 5- 1	Modern	tool usag	ge, PO 6- '	The engi	neer and	societ	y, PO 7- I	Environm	ent and	
sustainability, PO	8- Ethics,	PO ₉ - Ind	ividual o	or team v	vork, PO	10- Comm	unicatio	n, PO 11- P	roject 1	nanagen	nent and	finance,	
PO12- Life-long L	earning	Mann	ing of a	course c	utcome	es with r	rogram	outcom	es				
Course													
Outcomes	PO ₁	PO ₂	PO_3	PO_4	PO ₅	PO_6	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂	
CO ₁	2	3				2							
CO ₂			3	2	2								
CO ₃			3		3				1		2		
CO ₄			2	2	3	1						2	
			1 – Red	isonable	e; 2 – Sig	gnifican	t; 3 – Sti	rong					
Detailed Conte	nts:	T (1	T 4	1					1		1 • 1	
		Introc	luction	: Introc	luction	to Mo	bile Co	mputing	g, Intr	oductic Mobile	n to A	android	
Unit: 1		Mobil	opmen e	t Eliviio Softwar	e l	racio Fngineer	ring Fr	amewor	nig ks an	d Tool	Applic s Gene	eric III	
		Devel	opment	t Androi	id User	Lingineer	<u>6</u> , 11		K5 dil	u 1001	5, UCIN		
		More	on Uis:	VUIs a	nd Mob	ile Apps.	Text-to	o-Speec	h Tecł	niques	Design	ing the	
Unit, 9		Right	UI, M	ulticha	nnel an	d Multi	modal	Uis, Sto	oring	and Re	trieving	g Data,	
Unit: 2		Synch	ronizat	tion and	d Repli	cation o	of Mobi	le Data,	Gett	ing the	Model	Right,	
		Andro	id Stor	ing and	Retriev	ing Data	i, Worki	ng with	a Cont	tent Pro	ovider		
	Communications via						nd the	e Web:	Stat	e Mac	hine, (Correct	
Unit: 3	Unit: 3 Communications Model,					ndroid 1	Vetwork	ing and	l Web	, Telep	hony D	eciding	
	Scope of an App, Wireles					onnectiv	vity and	Mobile	Apps, I	Androic	Teleph	ony	
	Notifications and Alar						ce, Peri	ormanc	e and l	Memory	/ Manag Aultithr	ement,	
Unit A		Graphics and UI Performance Android Graphics Packaging and Deploying											
01110.4		Perfor	Performance Best Practices Android Field Service App Location Mobility and										
		Locat	Location Based Android Services										
T.T. *		Multi	nedia:	Mobi	le Ager	nts and	Peer	-to-Pee	r Ar	chitect	ure, A	ndroid	
Unit: 5		Multin	nedia	Platfe	orms	and A	ddition	al Issu	es: D	evelopr	nent P	rocess,	

	Archi	tecture, Design, Technology Selection, Mobile App Development Hurdles,										
	Testi	ng, Security and Hacking, Active Transactions, More on Security,										
	Hack	ng Android.										
Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class												
sessional exams/assignments/quiz/seminar presentation etc. and external evaluation (70 marks) which												
is mainly end semester examination.												
Text Books:												
1	John Horton, Android Pro	n Horton, Android Programming with Kotlin for Beginners: Build Android apps starting from zero										
	programming experience	with the new Kotlin programming language Kindle										
2	Catalin Ghita, Kickstart Modern Android Development with Jetpack and Kotlin: Enhance your											
	applications by integratin	g Jetpack and applying modern app architectural concepts										
Reference Books:												
1	Xamarin Mobile Applicati	on Development: Cross-Platform C# and Xamarin. Forms Fundamentals										
2	Android Programming: The Big Nerd Ranch Guide (5th Edition)											
Course Co	de			С	ourse T	itle			Leo	ture		
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MTCS245P	ET	(Graphi	es Proc	essing	Unit Co	mputir	ng	L	Т Р	Seme	ster: II
Version: 1.2			Date o	f Appro	val: 16tl	h BoS 17	-11-2022	2	4	0 0		
S	cheme o	of Instr	uction				S	cheme o	of Exar	ninatio	n	
No. of	Periods	: 60	Hrs.					Ma	ximum	Score	:	100
Periods	/ Week	: 4						Intern	al Eval	nation	:	30
Instruction	Node	· 4	cture					Fx	zam Di	iration	•	70 3 Hrs
Prerequisite(s):	Compu	ter Gr	aphics							ation	•	51115.
Course Objectiv	/es:		apineo									
1. To underst	and bas	sics of	GPU a	archited	ture, is	ssues in	mappi	ing algo	rithms	and o	lifferen	t GPU
programmii	ng Mode	ls.										
2. To introduc	e paralle	el progr	ammin	g funda	mentals	while fo	ocusing	on CUD	A prog	rammin	g inter	ace.
3. To acquain	t emergi	ing mul	ti-core	paralle	el comp	uting ar	chitectu	ire with	Grapl	nics Pro	cessing	g Units
(GPUS).	e the co	ncent o	fofflor	ding we	ork onto	CDUga	s accele	rators f	or vori	2116 200	lication	c
Course Outcom	es (CO).	neept o	01110a	ung we		Grusa	s accer			Jus app	lication	.5.
COs No.				St	atemer	nt				Мар	ped Pro	gram
										Out	comes	(POs)
CO ₁	Analyze	GPU a	archite	cture, a	ssess tl	neir adv	antages	and ide	entify	PO	2, PO 3, 1	PO ₁₂
	potenti	al softw	vare op	timizati	ons bas	ed on ki	nowledg	ge of the	GPU			
~~~	archited	cture			<b></b>	1.1.0						
$CO_2$	Unders	nderstand the working proficiency with CUDA to optimize and <b>PO1</b> , <b>PO2</b> , <b>PO3</b> , <b>PO4</b>								3, <b>PO</b> 4		
CO	Implem	ent effi	ient al	lgorithn	ns nara	llel prog	rammin	o natter	ms to	PO	PO PC	
003	solve re	al worl	d probl	ems.	iis, para	nei prog	,1 a1111111	g patter	115 00	102,	103,10	4,109
CO ₄	Compre	prehend the parallel programming techniques and PO ₂ , PO ₃ , PO ₄ , PO ₄										
	implementation of programs on GPUs.											
PO ₁ - Engineering	g Knowle	edge, PO	D ₂ - Pro	blem an	alysis, I	<b>PO</b> ₃ - Des	sign/dev	elopment	t of so	olutions,	PO ₄ - (	Conduct
investigations of a	complex p - Ethics	problem <b>PO</b> o- Ind	s, <b>PO</b> 5-1 lividual c	Modern or team y	tool usag vork <b>PO</b> 1	ge, <b>PO</b> 6- '	The engr	neer and n <b>PO</b> 11- P	society	', <b>PO</b> 7- E nanagem	nvironm ent and	ent and finance
PO ₁₂ - Life-long Le	arning	10, 110	irriduur		, i i i i i i i i i i i i i i i i i i i	o comm	unicatio	i, i on i	rojectii	lunugen	ent una	iniunee,
		Марр	ing of c	course c	outcome	es with p	orogram	outcom	es			
Course	PO ₁	PO ₂	PO ₃	PO₄	PO ₅	PO ₆	<b>PO</b> ₇	PO ₈	PO ₉	<b>PO</b> 10	<b>PO</b> ₁₁	<b>PO</b> ₁₂
Outcomes		0	4									
	2	2	2	1								3
	3	2	<u> </u>	1					1			
		2	3	1					1			1
	- I		1 - Red	isonable	e: 2 – Sid	nifican	t: 3 - St	rona				· ·
Detailed Conter	nts:				,	, <u>,</u>	,	J				
		Intro	luction	: Histor	y, Graph	nics Proc	essors,	Graphic	s Proce	essing U	nits, Gl	PGPUs.
		Clock	speeds	s, CPU	/ GPU	compar	isons, H	leteroge	neity,	Acceler	ators, 1	Parallel
Unit: 1		progr	amming	g, CUDA	Open	CL / Op	en ACC	, Hello V	Norld	Comput	ation K	ernels,
		Launc	h para	meters,	Thread	hierarc	hy, Wai	ps / W	ave fro	onts, Th	read bl	ocks /
		work	groups, rties S	Stream	ing mu	tiproces	ssors, IL	) / 2D /	3D thi	read ma	pping, I	Device
		Memo	orv: Me	morv h	ierarch	s. v. DRAN	1 / glol	al. loca	1 / sh	ared, p	rivate	/ local.
		textu	res, Cor	nstant N	lemory.	Pointer	s, Paran	neter Pa	ssing,	Arrays a	ind dyn	amic
Unit: 2		Memo	ory, Mu	lti-dime	ensional	Arrays,	Memor	y Allocat	ion, M	emory o	copying	across
devices, Programs with matrices, Performance evaluation with different							fferent					
		memo	ories.									
		Synch	ronizat	ion: Me	emory (	Consiste	ncy, Bai	riers (lo	ocal ve	rsus glo	bal), A	tomics,
		Memo	ory fenc	e. Prefi	x sum, F	Reductio	n. Prog	rams for	concu	rrent D	ata Stri	ictures
Unit: 3		Such a	as Work	ione U	IIKed-li	sts. Sync	INTONIZA	function	OSS CP	U and G	run Fun	ictions:
		Thrus	t) and	develor	ing libr	cuons, . aries	Reineis	runcuo	ns, US	ing nor	aries (S	ucii as
		imus	ij, anu	αυνεισμ	ing inte	ai 105.						

	Unit: 4	Support: Debugging GPU Programs. Profiling, Profile tools, Performance aspects Streams: Asynchronous processing, tasks, Task-dependence, Overlapped data transfers, Default Stream, Synchronization with streams. Events, Event-based- Synchronization - Overlapping data transfer and kernel execution, pitfalls.
	Unit: 5	Image Processing, Graph algorithms, Simulations, Deep Learning. Advanced topics: Dynamic parallelism, Unified Virtual Memory, Multi-GPU processing, Peer access, Heterogeneous processing.
Exa	mination and Evalua	ation Pattern: It include both internal evaluation (30 marks) comprising two class
sess	ional exams/assign	ments/quiz/ seminar presentation etc. and external evaluation (70 marks) which
is m	ainly end semester of	examination.
Text	t Books:	
1	Shane Cook, CUD (Applications of C	A Programming: —A Developer's Guide to Parallel Computing with GPUs GPU Computing), First Edition, Morgan Kaufmann, 2012
2	David R. Kaeli, Per	rhaad Mistry, Dana Schaa, Dong Ping Zhang, —Heterogeneous computing with
	OpenCL, 3rd Editio	on, Morgan Kauffman, 2015.
Refe	erence Books:	
1	Jason Sanders, Ed	ward Kandrot, —CUDA by Example: An Introduction to General Purpose GPU
	Programming, Add	lison – Wesley, 2010
2	Nicholas Wilt, —C	JDA Handbook: A Comprehensive Guide to GPU Programming, Addison – Wesley,
	2013.	

Course Coo	le			С	ourse T	itle			Lee	cture		
MTCS246P	ЕТ			Big D	Data An	alytics			L	T P	Seme	ster: II
Version: 1.2			Date of	Approv	7 <b>al:</b> 18th	BoS 27-	-02-202	4	4	0 0		
S	cheme o	of Instru	uction				S	cheme of	of Exa	minatio	n	10.0
No. of I	Periods	: 60	Hrs.					Ma	ximun	1 Score		100
Periods	⁷ week	: 4						Intern	al Eva	mostor	:	30 70
Instruction	Mode	· 4	oture					f	zam Di	uration	•	70 3 Hrs
Prerequisite(s):	Compu	ter Gr	aphics					112		aración	•	5 1115.
Course Objectiv	ves:		apines									
1. To learn the	e need o	f Big D	ata and	the va	rious cł	nallenge	s involv	ed and t	to acq	uire Kno	owledge	e about
different an	alytical a	archited	tures.			U					0	
2. To understa	nd Hado	oop Arc	hitectu	re, ecos	ystems	and acq	uire kno	owledge	about	the No.	SQL dat	abase.
3. To acquire l	knowled	ge abou	t the N	ewSQL,	Mongo	DB and	Cassano	lra data	bases.			
4. To Apply the	e proces	sing of	Big Dat	a with a	dvance	d archit	ectures	like Spa	rk.			
Course Outcom	es (CO):					- 4					1.0	
COS NO.				St	atemer	10				Map	pea Pro	(DOc)
CO	Unders	tand th	- know	edge of	Big Da	ta Data	Analyti	rs chall	endes	PC	$\mathbf{PO}_{\mathbf{a}}$	PO ₁₀
	and the	ir soluti	ions in 1	Big Data		ta, Data	7 mary en	citano	inges	10	2, 1 03, 1	. 012
CO ₂	Analyze	Hadoo	p Fram	ework a	nd Eco	systems	5.			PO ₁ ,	PO ₂ , PO	)3, PO4
CO ₃	Analyze	MapR	educe	and Ya	rn, Wo	rk on N	VoSQL	environ	ment.	<b>PO</b> ₂ ,	<b>PO</b> ₃ , <b>PC</b>	<b>)</b> ₄ , <b>PO</b> ₉
	Mongol	OB and	Cassan	dra.	-						•	
CO ₄	Apply E	Big Data	using	Map-re	educe p	orogram	ming in	Hadooj	o and	<b>PO</b> ₂ , 2	PO3, PO	4, <b>PO</b> 12
	spark fr	amewo	rk									
<b>PO</b> ₁ - Engineering	g Knowle	edge, <b>P</b>	D ₂ - Prol	olem an	alysis, <b>I</b>	PO ₃ - Des	sign/dev	elopmen	t of s	olutions,	PO ₄ - (	Conduct
sustainability PO	- Ethics	Problem P <b>O</b> ₀- Ind	s, PO5- r ividual c	or team w	ork <b>PO</b>	ge, <b>PO</b> 6- 10- Comm	unicatio	n <b>PO</b> 11- P	roject r	y, <b>PO</b> 7- E nanagem	nvironin ent and	finance
PO ₁₂ - Life-long Le	arning		ivia da la		on, <b>1</b> 0	lo comm	ameatro	n, <b>1</b> On 1	rojecti	nunugen	iene una	innunce,
	Č.	Марр	ing of c	ourse o	utcome	es with p	orogram	outcom	nes			
Course	PO ₁	PO ₂	PO₃	PO₄	PO₅	POs	PO ₇	POs	PO	<b>PO</b> 10	PO ₁₁	<b>PO</b> 12
Outcomes	101	102	103	104	103	100	10/	108	103	1 0 10	101	
	0	2	1	4								3
	3	2	<u>Z</u>	1					1			
		3	2	<u> </u>					1			1
		2	ی 1 ـ Dea	sonahle	· 2 - Sid	anificant	t· 3 - St	rona				
Detailed Conter	nts:		1 - Keu	isonubie	<u>, 2 - 5u</u>	yngican	i, 5 – 5i	long				
	105.	Introd	luction	to big d	lata: Da	ta. Char	acterist	ics of da	ata and	l Types	of digit	al data:
		Unstr	uctured	l, Semi-	-structi	ured and	d Struc	tured -	Sourc	ces of o	lata. Bi	g Data
Unit: 1		Evolu	tion -	Definiti	ion of	big dat	a-Chara	acteristi	cs and	1 Need	of big	g data-
Unit. I		Challe	nges o	f big da	ta. App	lications	s of Big	Data, D	ata An	alytics,	Types of	of Data
		Analy	tics, Da	ta Analy	tics Me	thods ar	nd Tech	niques, l	Big dat	a analyt	tics, Dat	a Lake,
		Archit	ecture	of Data	Lake. C	)verview	of busi	ness int	elligen	.ce.	, 0 -	T 1
LL . H. O		Big d	ata teo	hnolog	ies and	1 Databa	ases: H	adoop	- Req	uireme	nt of F	ladoop
Unit: 2		Frame	WORK -	Design	princij	ple of Ha	adoop – Archite	Compar	'ison w Hadaa	nth oth	er syste	m SQL
		MapP	oduce a	nd VAP	N fram	onents -	- Al Cillu ntroduc	tion to	ManPe	duce D	rocessi	<u>.</u> na data
		with H	Hadoon	using M	ManRed	uce Int	roductio	ration to YA	RN A	rchitect	ure Ma	inaging
Unit: 3		Resou	rces ai	nd App	lication	s with	Hadoop	YARN.	Big d	ata tec	hnologi	es and
		Datab	ases: N	oSQL: II	ntroduc	ction to 1	NoSQL	- Featur	es and	l Types-	Advant	tages &
		Disad	vantage	es -Appl	ication	of NoSC	ξL.			01		U
		New S	SQL: Ov	erview	of New	SQL - C	omparir	ng SQL, i	NoSQI	and Ne	ewSQL.	Mongo
	DB: Introduction – Features – Data types – Mongo DB Query language – CRUD											
	operations – Arrays – Functions: Count – Sort – Limit – Skip – Aggregate – Map											
Unit: 4	4 Reduce. Cursors – Indexes – Mongo Import – Mongo Export. Cassandra:											
		Introd	luction	- Featu	res – D	ata type	s – CQL	SH – Ke	y spac	es – CR	UD ope	rations
		- Colle	ections	– Coun	ter – 'I'l	L – Alter	r comma	ands – Ír	nport	and Exp	ort – Qı	lerying
		Syster	n tables	s								

Unit: 5		Hadoop Frame Work: Map Reduce Programming: I/O formats, Map side join-					
		Reduce Side Join-Secondary Sorting- Pipelining MapReduce jobs. Spark Frame					
		Work: Introduction to Apache Spark-How spark works, Programming with RDDs:					
		Create RDDspark Operations-Data Frame.					
Exa	mination and Evalu	ation Pattern: It include both internal evaluation (30 marks) comprising two class					
sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 mar							
is m	ainly end semester	examination.					
Text	t Books:						
1	Tom White, "Hado	op: The Definitive Guide", O"Reilly, 4th Edition, 2015.					
2	2 Mohammed Guller, "Big Data Analytics with Spark", Apress, 2015						
Refe	Reference Books:						
1	Seema Acharya an	d Subhashini Chellappan, "Big Data and Analytics", Wiley India Pvt. Ltd., 2016.					
2	Mike Frampton, "M	Mastering Apache Spark", Packt Publishing, 2015.					

Course Coo	le			С	ourse T	'itle			Leo	eture	0	
MTCS311PH	ΞT			De	ep Leai	rning			L	Т Р	Sem	ester:
Version: 1.2			Date of Approval: 16th BoS 17-11-2022         4         0         0									
S	cheme o	of Instru	uction				S	cheme o	of Exai	ninatio	n	
No. of I	Periods	: 60	Hrs.					Ма	ximum	n Score	:	100
Periods	/ Week	: 4	4 Internal Evaluation : 30									30
(	Credits	: 4						E	End Sei	mester	:	70
Instruction	n Mode	: Lecture Exam Duration : 3 Hrs.										
Prerequisite(s):	Machin	ne Lear	ning									
Course Objectiv	ves:											
1. To understa	nd the c	context	of neur	al netw	orks an	d deep l	earning.					
2. To understa	nd the u	ise of a	neural	networl	k and ne	eed of de	eep lear	ning.				
3. To gain wor	king kno	owledge	of neu	ral netv	vorks ar	nd deep	learning	<u>.</u>				
4. To Explore t	the para	meters	for neu	ral netv	vorks.							
Course Outcom	es (CO):										1.0	
COs No.				St	atemer	it				Мар	ped Pro	ogram
CO	Undong	tond th	basios	000000	ta of d		ing			Dut	comes	(POs)
	Apply th		- Dasies	function	ia doop	loornin	ning. A algorit	hma		PO ₁ ,	$PO_2, PC$	$\mathbf{D}_3, \mathbf{PO}_4$
	Apply u	tond on	d Applu	CNN o	nd DNN	iear ming	lation fo	nnis.	rorld	PO ₂ , 1	$PO_3, PC$	$\mathbf{P}_{4}, \mathbf{P}_{10}$
CO3	applicat	tanu an	u Appiy	CININ a	nu kinin	i ili siiliu		n rear-v	voriu	PO3,	PO4, PC	<b>J</b> 5, <b>PU</b> 9
CO	Analyze	the ch	allenge	inhere	ent in de	velonin	r deen l	earning		PO ₂		
004	algorith	ms for	differer	t uses	int in ut	veloping	gueepi	carming		FO ₂ , 1	PO4 PC	4, FO5,
<b>PO</b> ₁ - Engineering	Knowle	edge. <b>P</b>	$D_{2}$ - Prob	olem an	alvsis. I	PO ₃ - Des	sign/dev	elopment	t of so	olutions.	PO ₄ - (	Conduct
investigations of o	complex	problem	s, <b>PO</b> 5- 1	Modern	tool usag	ge, <b>PO</b> 6- '	The engi	neer and	society	, <b>РО</b> 7- Е	nvironn	ent and
sustainability, POs	- Ethics,	₽O₀- Ind	ividual c	r team w	vork, <b>PO</b>	10- Comm	unicatio	n, <b>PO</b> 11- P	roject n	nanagem	ent and	finance,
PO12- Life-long Le	arning											
	1	Марр	ing of c	ourse o	utcome	es with p	rogram	outcom	es	1	1	1
Course	PO ₁	PO ₂	PO ₃	PO₄	PO ₅	PO ₆	PO ₇	PO ₈	PO	<b>PO</b> 10	PO ₁₁	PO ₁₂
Outcomes					- 00	100	- 07			- 010	- 011	1 0 12
	2	2	3	3								
		3	3	2	-					1		
<u>CO3</u>		-	3	2	2				2			
CO4		3	3	3	3						3	2
			1 – Rea	sonable	e; 2 – Sų	gnificant	t; 3 – Sti	rong				
Detailed Conter	nts:						D! 1	. 1		x 1 C		
		Introc	luction	to Deep	D Learni	ing: Basi	cs: Biolo	gical Ne	euron,	Idea of	comput	ational
Unit: 1		units,	MCCU	llocn-	PITTS U	init and	1 Inres	nolding	logic	, Linea	r Perc	eptron,
		Perce	ptron I	earning	g Algorit	uiiii, Lii hm	lear sep	arability	. Con	vergenc	e theor	em for
		Feed	forwar	d Netv	orke	Multila	ver De	rcentror	Gra	dient I	Jescent	Back
Unit: 2		propa	gation	Empirio	ral Risk	Minimiz	ation r	oulariz	ation a	auto en	roders	, Dack
		Convo	olutiona	1 Netw	orks: T	he Conv	volution	Operat	ion -	Variant	s of th	e Basic
Unit: 3		Convo	olution	Functio	n - Stru	ctured (	Dutputs	- Data T	vpes -	Efficier	nt Conv	olution
		Algori	thms -	Randon	n or Un	supervis	ed Feat	ures- Le	Net. A	lexNet		
		Recur	rent N	eural N	etwork	s: Bidire	ctional	RNNs -	Deep	Recurr	ent Ne	etworks
Unit: 4		Recur	sive Ne	ural Ne	tworks	- The L	ong Sh	ort-Terr	n Men	nory and	d Other	Gated
		RNNs					C			·		
		Deep	Genera	tive Mo	dels: Bo	ltzmann	Machin	ies - Res	tricted	l Boltzm	nann Ma	achines
- Introduction to MCMC and Gibbs Sampling- gradient computations in RBMs												
Applications: Large-Scale Deep Learning - Computer - Speech Recognition -												
		Natur	al Lang	uage Pr	ocessin	g - Othe	er Applic	ations				
Examination an	d Evalua	ation Pa	attern:	It inclue	le both	internal	evaluat	ion (30	marks)	compr	ising tw	o class
sessional exams	/ assign	ments/	′ quiz/	semina	r preser	ntation e	tc. and	external	evalua	ation (70	) marks	) which
is mainly end se	mester e	examina	ation.									
Text Books:		•						-	0.1.6			
1 Goodfello	w,I.,Beı	ngio,Y.,	andCo	urville,	A.,Dee	pLearni	ng,MIT	Press,2	016.			

2	Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1 (2009):1127.
Refe	erence Books:
1	Nikhil Buduma, "Fundamentals of Deep Learning: Designing Next-Generation Machine
	Intelligence Algorithms" O'Reilly publications

Course Co	de			C	OUTER T	'itle			Ier	ture		
MTCS312D	uc FT	Seci	Secure Software Design & Enterprise Computing								Sem	ester:
Version: 12		Beet	Date of	f Appro	<b>val</b> : 16t	th BoS 17-11-2022				$\frac{1}{0}$	-	III
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Perious	Crodita	· 4							ar Eval	mostor	•	70
Instructio	n Modo	· 4	End Schlester :									70 2 Urg
Droroquisite(s)	Softwar	re Engi	ineerin	ď				E2		li ation	·	51115.
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CO.	Analyze	variou	s softw	aro vuln	orabilit	ios				Out	DO DO	(FOS)
	Unders	tand So	ftware		wulner	nos. Abilitios	for an o	ranizat	ion	DC	$\mathbf{PO}_1, \mathbf{PC}_2$	
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	Apply g	anu an	and sof	tworo d	lovelop	nont pr		isoliwa	IC.	DO.	$\mathbf{PO}_{4}, \mathbf{PC}_{1}$	$\mathbf{D}_{5}$
$CO_4$	Apply se	ecurity	anu soi	twale u	levelopi	nent pro	JUESS.			<b>FO</b> 3, 1		⁵ , P <b>O</b> 9,
<b>DO</b> ₁₋ Engineerin	g Knowle	da Da	De- Drol	alom an	alveie I	$\mathbf{D}_{\mathbf{n}}$ Do	nign /day	olonmont	t of s	lutions		Conduct
PO1- Engineerin	g Kilowie	age, P	$J_2$ Prop	Modorn	talysis, I	$T_{03}$ - Des	sign/uev	elopinen	cooiota	$\frac{1}{2}$ <b>DO</b> E	PO ₄ - (	conduct
investigations of	complex p	plex problems, PO ₅ - Modern tool usage, PO ₆ - The engineer and society, PO ₇ - Environment and										
customobility PC	<b>D</b> ₈ - Ethics, <b>PO</b> ₉ - Individual or team work, <b>PO</b> ₁₀ - Communication, <b>PO</b> ₁₁ - Project management and finance,								roject r	nanadem	ent and	finance
sustainability, PO	8- Ethics, I Parning	<b>PO</b> 9− Ind	lividual c	or team w	vork, <b>PO</b>	10- Comm	unication	n, <b>PO₁₁-</b> P	roject n	nanagem	ent and	finance,
PO ₁₂ - Life-long L	8- Ethics, 1 earning	PO ₉ - Ind	lividual c	or team w	vork, <b>PO</b>	$\frac{1}{100}$ - Comm	unication	n, <b>PO</b> 11- P	roject n	nanagem	ent and	finance,
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Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Conte Unit: 1	PO1 1 nts:	PO ₉ - Ind Mapp PO ₂ 2 1 Secur securi softwa assura Enter enter Resea an en enter enter enter enter	ividual c ing of c PO ₃ 2 2 1 - Rea e Softw ity anal- are sec ance. prise A prise so rch tec aterprise prise da prise sy ologies	PO4 PO4 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	vork, <b>PO</b> ₅ <b>PO</b> ₅ <b>PO</b> ₅ <b>2</b> 2 2 2 2 2 2 2 2 2 2 2 2 2	entify so curity p concep velopme ions, De able for plication , Develo nd deve	PO7 PO7 PO7 t; 3 – Str oftware rogrami ts, Perf ent – D esign dis the pre- n, Desig op comp lop a mi	PO ₁ -P outcom PO ₈ rong vulneration orm se escribe tributed sentation on and ponents ulti-tier	PO ₉ PO ₉ 2 illities actices curity the r N-tien n, busi build at the solutie	PO ₁₀ PO ₁₀ and per and per testing nature r softwa iness an a datate e differe on to a solution	ent and PO ₁₁ form so r funda g and sand sc re appli d data base us ent tier problem	PO ₁₂ PO ₁₂ 2 oftware mental quality ope of ication, tiers of sing an s in an n using
Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Conte Unit: 1	PO1 1 nts:	PO ₉ - Ind Mapp PO ₂ 2 1 Secur securi softwa assura Enter Resea an enter enter techn	ividual c ing of c PO ₃ 2 2 1 - Rea e Softw ity anal- are sec ance. prise A prise so rch tec iterprise prise da prise sy ologies	PO4 PO4 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	vork, <b>PO</b> ₅ <b>PO</b> ₅ <b>PO</b> ₅ <b>2</b> 2 2 2 2 2 2 2 2 2 2 2 2 2	entify so curity p concep velopme ions, De able for plication a, Develo nd deve	PO7 PO7 PO7 PO7 t; 3 – Str oftware rogrami ts, Perf ent – D esign dis the pres n, Desig op comp lop a m cem, Pre	PO ₈ PO ₈ PO ₈ vulneration form se escribe tributed sentation for and ponents alti-tier sent sof	PO ₉ PO ₉ 2 illities actices curity the r N-tien n, busi build at the solution	PO ₁₀ PO ₁₀ and per and per testing testing nature to softwa iness an a datab e differe on to a solution	ent and PO ₁₁ form so r funda g and cre appli d data base us ent tier problem	PO ₁₂ PO ₁₂ 2 oftware mental quality ope of ication, tiers of sing an s in an n using
Sustainability, PO PO ₁₂ - Life-long Li Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Conte Unit: 1	PO1 1 nts:	PO ₉ - Ind Mapp PO ₂ 2 1 Secur securi softwa assura Enterj enterj Resea an en enterj enterj techn Enterj direct	ing of c ing of c PO ₃ 2 2 1 - Rea e Softw ity analy are sec ance. prise A prise so rch tec iterprise prise da prise sy ologies prise So	PO4 PO4 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	vork, <b>PO</b> ₅ <b>PO</b> ₅ <b>PO</b> ₅ <b>PO</b> ₅ 2 2 2 2 2 2 2 2 2 2 2 2 2	entify so curity p concep velopme ions, De able for plication , Develo nd deve rise syst	PO7 PO7 PO7 PO7 t; 3 – Str oftware rogrami ts, Perf ent – D esign dis the pre- n, Design op comp- lop a mi cem, Pre- pon: Design pon: Desi	PO ₈ PO ₈ PO ₈ vulneration orm se escribe tributed sentation on and ponents ulti-tier sent soff ign, im	PO ₉ PO ₉ 2 illities actices curity the r N-tien n, busi build at the solution tware plemen	PO ₁₀ PO ₁₀ and per and per and per testing nature r softwa iness an a datate differe on to a solution	ent and PO ₁₁ form so r funda g and sc re appli d data oase us ent tier probler t.	PO ₁₂ PO ₁₂ 2 oftware mental quality ope of ication, tiers of bing an s in an n using tain a pment
Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Conte Unit: 1 Unit: 2	PO1 1 nts:	PO ₉ - Ind Mapp PO ₂ 2 1 Secur secur softwa assura Enter enter enter Resea an en enter enter techn Enter direct mon ^{it}	ing of c ing of c PO ₃ 2 2 1 – Rea e Softw ity analy are sec ance. prise A prise so rch tec: nterprise prise da prise sy ologies prise So ory-bas	PO4 PO4 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	vork, <b>PO</b> ₅ <b>PO</b> ₅ <b>PO</b> ₅ <b>PO</b> ₅ <b>2</b> 2 2 <b>2</b> <b>2</b> <b>2</b> <b>2</b> <b>2</b> <b>2</b>	entify so curity p concep velopme ions, De able for plication , Develo nd deve rise syst nistration	PO7 PO7 PO7 <b>PO</b> 7 <b>t; 3 - St</b> 7 oftware 7 rogram ts, Perf ent - D esign dis the pre- n, Desig op comp- lop a m cem, Pre- pri Design a m cem, Pre- p	PO ₈ PO ₈ PO ₈ vulneration orm se escribe tributed sentation fin and ponents ulti-tier sent soff ign, in eterogen	PO ₉ PO ₉ 2 illities actices curity the r N-tien n, busi build at the solution tware pleme neous bility	PO ₁₀ PO ₁₀ and per and per and per and per testing r softwa iness an a datate e differe on to a solutior ent and systems	ent and PO ₁₁ form so r funda g and and sc re appli d data wase us ent tier probler a. l main s enviro lability	PO ₁₂ PO ₁₂ 2 oftware mental quality ope of ication, tiers of sing an s in an n using tain a nment, Install
Sustainability, PO PO ₁₂ - Life-long Li Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Conte Unit: 1 Unit: 2	PO1 1 nts:	PO ₉ - Ind Mapp PO ₂ 2 1 Secur secur softwa assura Enterj enterj Resea an en enterj enterj techn Enterj direct monit	ing of c ing of c PO ₃ 2 2 1 – Rea e Softw ity analy are sec ance. prise A prise So rch tec rch tec prise da prise sy ologies prise Sory-bas or serv.	PO4 PO4 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	vork, <b>PO</b> ₅ <b>PO</b> ₅ <b>PO</b> ₅ <b>PO</b> ₅ <b>2</b> 2 2 <b>2</b> <b>2</b> <b>2</b> <b>2</b> <b>2</b> <b>2</b>	PO ₆ PO ₆ PO ₆ entify so curity p concep velopme ions, De able for plication , Develo nd deve rise syst nistration	PO7 PO7 PO7 t; 3 – Sta oftware 7 rogram ts, Perf ent – D esign dis the prea n, Desig op comp lop a m cem, Pre on: Des re in a h for syst	PO ₈ PO ₈ PO ₈ vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong vulneration rong	PO ₉ PO ₉ 2 illities actices curity the r N-tien n, busi build at the solution tware pleme heous bility a	PO ₁₀ PO ₁₀ and per and per and per and per testing testing a datate differe on to a solution ent and systems and avai	ent and PO ₁₁ form sc r funda g and and sc re appli d data base us ent tier probler a. I main s enviro lability, UCP / T	PO ₁₂ PO ₁₂ 2 oftware mental quality ope of ication, tiers of sing an s in an n using tain a nment, , Install
Sustainability, PO PO ₁₂ - Life-long Li Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Conte Unit: 1 Unit: 2	PO1 1 nts:	PO ₉ - Ind Mapp PO ₂ 2 1 Secur secur softwa assura Enterj enterj Resea an en enterj enterj techn Enterj direct monit and Servic	ividual c ing of c PO ₃ 2 2 1 - Rea e Softw ity analy are sec ance. prise A prise so orch tec prise da prise so prise da prise so prise so orch tec prise so orch tec prise so prise s	PO4 PO4 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	vork, <b>PO</b> ₅ <b>PO</b> ₅ <b>PO</b> ₅ <b>2</b> 2 2 2 <b>2</b> <b>3</b> <b>3</b> <b>4</b> <b>5</b> <b>4</b> <b>5</b> <b>5</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b>	entify so curity p concep velopme ions, De able for plication developme rise syst nistration network	PO7 PO7 PO7 t; 3 – Str oftware r rogram ts, Perf ent – D esign dis the prea n, Desig op comp lop a m cem, Pre on: Des re in a h for syst se	PO ₈ PO ₈ PO ₈ vulneration orm se escribe tributed sentation fin and ponents ulti-tier sent soff ign, im eterogenetices	PO ₉ PO ₉ 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PO ₁₀ PO ₁₀ and per and per and per testing testing testing a datate differe on to a solution ent and systems and avai DNS/DI	ent and PO ₁₁ form sc r funda g and and sc re appli d data base us ent tier probler	PO ₁₂ PO ₁₂ 2 oftware mental quality ope of ication, tiers of sing an s in an n using tain a nment, , Install erminal
Sustainability, PO PO ₁₂ - Life-long Li Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Conte Unit: 1 Unit: 2	PO1 1 nts:	PO ₉ - Ind Mapp PO ₂ 2 1 Secur softwa assura Enter Resea an en enter Resea an en enter direct monit and Servic Obtai	ividual c ing of c PO ₃ 2 2 1 - Rea e Softw ity analy are sec ance. prise A prise So rch tec nterprise prise da prise sy ologies prise So ory-bas or serv adr ces/Clu	POURSE CONTROLOGY PO4 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	vork, <b>PO</b> ₅ <b>PO</b> ₅ <b>PO</b> ₅ <b>PO</b> ₅ <b>2</b> 2 2 2 2 2 2 2 2 2 2 2 2 2	PO ₆ PO ₆ PO ₆ PO ₆ entify so curity p concep velopme ions, De able for plication able for plication able for plication istration network Email).	PO7 PO7 PO7 t; 3 – Str oftware rogram ts, Perf ent – D ssign dis the pre- n, Desig op comp lop a m cem, Pre on: Desi re in a h for syst	PO ₈ PO ₈ PO ₈ PO ₈ vulneration rong vulneration rong vulneration rong rong rong rong vulneration rong rong rong rong rong rong rong ro	PO ₉ PO ₉ 2 pilities actices curity the r N-tien n, busi build at the solution tware pleme heous bility a (I	PO ₁₀ PO ₁₀ and per and per s, Maste testing testing a datate e differe on to a solution ent and systems and avai DNS/DF	ent and PO ₁₁ form sc r funda g and and sc re appli d data base us ent tier probler t main e enviro lability. HCP/Te	PO ₁₂ PO ₁₂ 2 oftware mental quality ope of ication, tiers of sing an s in an n using tain a nment, , Install erminal
Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Conte Unit: 1 Unit: 2	PO1 1 nts:	PO ₉ - Ind Mapp PO ₂ 2 1 Secur softwa assura Enterj enterj Resea an en enterj enterj direct monit and Servic Obtain servic	ividual c ing of c PO ₃ 2 2 1 - Rea e Softw ity analy are sec ance. prise A prise So rch tec tterprise prise da prise sy ologies prise Sory-bas or serv adr ces/Clu n the a	POUTSE C PO4 PO4 3 3 3 3 3 3 3 3 3 3 3 3 3	vork, <b>PO</b> ₅ <b>PO</b> ₅ <b>PO</b> ₅ <b>PO</b> ₅ <b>PO</b> ₅ <b>2</b> 2 2 2 2 2 2 2 2 2 2 2 2 2	entify so curity p conceptions, Dec able for plication able for plication d develor instration istructure lization network Email). age and	PO7 PO7 PO7 t; 3 – Str oftware rogrami ts, Perf ent – D esign dis the pres n, Desig op comp lop a m cem, Pre on: Desi re in a h for syst strouble	PO ₁ -P outcom PO ₈ PO ₈ vulnerat ning pra orm se escribe tributed sentatio cn and ponents ulti-tier sent sof ign, in eterogen em relia ervices	PO ₉ PO ₉ 2 polities actices curity the r N-tien n, busi build at the solution tware pleme heous bility a (I	PO ₁₀ PO ₁₀ and per and per by Maste testing testing a datate con to a solution ent and systems and avai DNS/DF ork run	ent and PO ₁₁ form sc r funda g and and sc re appli d data base us ent tier probler t. I main enviro lability, ICP/Te ming n	PO ₁₂ PO ₁₂ 2 oftware mental quality ope of ication, tiers of sing an s in an n using tain a nment, , Install erminal

	Unit: 5	Handle insecure exceptions and command/SQL injection, Defend web and mobile applications against attackers, software containing minimum vulnerabilities and flaws. Case study of DNS server, DHCP configuration and SQL injection attack						
Fyon								
Exan	<b>Examination and Evaluation Pattern</b> : It include both internal evaluation (30 marks) comprising two class							
sessi	sessional exams/assignments/quiz/seminar presentation etc. and external evaluation (70 marks) which							
is ma	inly end semester	examination.						
Text	Books:							
1	Theodor Richardson, Charles N Thies, Secure Software Design, Jones & Bartlett							
Refe	rence Books:							
1	Kenneth R. van Wy	/k, Mark G. Graff, Dan S. Peters, Diana L. Burley, Enterprise Software						

Course Co	de			С	ourse T	itle			Le	cture		
MTCS313P	ET		Wir	eless A	ccess T	Technologies L				Т Р	Sem	ester:
Version: 1.2			Date o	f Appro	val: 16tl	n BoS 17-	-11-2022	2	4	0 0	1	11
S	cheme o	of Instru	uction				Scheme of Examination					
No. of I	Periods	: 60	Hrs.					Ма	ximun	n Score	:	100
Periods	/ Week	: 4						Intern	al Eva	luation	:	30
	Credits	: 4						E	End Se	mester	:	70
Instruction	n Mode	: Lee	cture					Ex	kam Di	uration	:	3 Hrs.
Prerequisite(s):	Compu	ter Ne	tworks									
Course Objectiv	ves:	- C 1 1		1	1		·1					- 1. 11.4
I. To gain an o	verview	of wire	less acc	ess tech	nologie	es, Fixed	wireles	saccess	netwo	orks. Ter	minal m	lobility
2 To introduc	ung wi	eless a	ork tor		boten	ot netwo	orke Co	mmunic	ontion	links: n	oint_to_	point
2. To incroduce	ultinoint	multir	oint-to	-multir	, notspo	Junetwo	JI KS, CO	mmum	ation	miks. p	5111-10-	point,
3 To provide	an overvi	iew of S	tandar	ds for m	ost frec	uently i	ised wir	eless ac	cess n	etworks	·WPAN	UWB
WLAN, WM	AN. WW	AN. Net	work s	ervices.	Wireles	s acces	s netwo	rks plan	ning. d	lesign a	nd insta	llation.
4. To get and	insight c	of Wirel	ess net	working	g securi	ty issues	s, Wirel	ess acce	ss net	work ex	ploitati	on and
managemer	nt, softwa	are requ	uiremei	nts, link	quality	control.	•				1	
Course Outcom	es (CO):				<b>*</b>							
COs No.				St	atemen	nt				Мар	ped Pro	gram
										Out	comes (	POs)
CO ₁	Unders	tand ba	sic tern	ns and c	characte	eristics o	of wirele	ss acces	SS		PO ₁ , PO	5
	networ	rks.								20		
	Analyze	various	s wirele	ess acce	ss techi	1010gles	trucorle p	momoto			$D_2, PO_4, I$	
	Analyze	measu	rement	S OI WIT	eless ac	cess net	twork p	aramete	r.		$D_3, PO_4, D_2$	
CO ₄	Apply a	na Asse	ss secu	rity issu	ies in w	ireless n		S	t of a	PO ₄ , I	$PO_5, PO_1$	$0, PO_{12}$
investigations of	complex i	oroblem	5 PO5- 1	Modern i	tool usad	703- Des ve PO6- 1	Sigii/uev The engi	neer and	societ	oiuuons, v <b>PO</b> 7- F	nvironm	ent and
sustainability. PO	- Ethics.	PO9- Ind	ividual c	or team w	vork. <b>PO</b> 1	0- Comm	unicatio	n. <b>PO</b> 11- P	roiect	nanagem	ent and f	finance.
PO12- Life-long Le	earning	-			,	-		,	5	0		,
		Марр	ing of c	course c	utcome	es with p	orogram	outcom	les			
Course	PO ₁	PO ₂	PO₃	PO₄	PO ₅	POs	PO ₇	POs	PO	PO ₁₀	PO ₁₁	<b>PO</b> 12
Outcomes	101	102	103	101	103	100		100	103	1010	101	1 012
	2				2							
		2	-	2	-	2						
CO3	-		2	3	3					0		0
CO4			1 D.	2	2	• c•	. 0 Gt			2		2
Detailed Contor			1 – Red	isonable	; z - sig	Inificant	t; 3 - Sti	rong				
Detailed Conte	nts:	Nocos	city fo	r wiro	logg to	rminala	conno	otivity	and	otwork	ing W	irologg
		netwo	sity 10	advan	iess ie	and di	isadvant	-area C	anu i	ietwork	ing. w	
Unit 1		techn	ologies	Narro	whand	and h	roadhar	nd netv	vorks	fived	and no	madic
Onic. I		netwo	orks. Wi	reless lo	ocal looi	o (WLL).	Public	Switcher	t Teler	phone N	etwork	(PSTN)
		interf	aces.		]	- ( · ·),			1			(-~)
		Fixed	wireles	s acces	s (FWA)	networ	ks, freq	uency b	ands f	or diffe	ent net	works.
L Locitor O		Criter	ions f	or free	uency	bands	allocati	on, Ne	twork	topolo	gies, h	otspot
Unit: 2		netwo	orks. Co	ommun	ication	links: p	oint-to-	point (	PTP),	point- 1	to- mul	tipoint
		(PMP)	, multip	oint-to	-multip	oint (M	ΓМ).					
		Stand	ards fo	r most	frequer	ntly used	d wirele	ss acce	ss net	works: `	WPAN (	802.15,
		Blueto	ooth, I	DECT,	IrDA),	UWB	(Ultra-V	Videban	d), W	/LAN (	802.11,	Wi-Fi,
	HIPERLAN, IrDA), WMAN(802.16, WIMAX, HIPERMAN, HIPERACCESS), WWAN								WWAN			
Unit: 3		(802.2	0), Oth	er tech	inologie	s for br	oadban	d wirele	ess aco	cess, Lo	cal Mul	tipoint
		Distri	Dution	Service	e (LMD	S), Mul	tichann	el Mult	ipoint	Distrib	ution S	service
	(MMDS). AU - HOC NELWORKS, NELWORK SERVICES. SERVICES Types based on carrier							carrier				
	frequency and bandwidth											
Unit 1		legisla	tive an	css neu d techn	ical aep	ects Te	chnical	and Eco	nomic	ni. Serv Pal facto	rs for p	etwork
01110. 4		planni	ing: exr	enses 4	coverao	e. link c	apacity	networl	k com	olexity a	nd carri	ier-to-
L					ug	-, mm ce	arucity,			security a		

r		
		interference ratio (C/I). Base station or access point allocation. Base station and
		access point equipment. Terminal mobility issues regarding wireless access to
		Internet. Wireless networking security issues.
Unit: 5		Example of laptop or handheld PC wireless connection in real environment. PC wireless interface equipment. Wireless access network exploitation and management, software requirements, link quality control. Business model, wireless network services market, market research and marketing, service providers, wireless data application service providers (WDASP) and their role on public telecommunication services market, billing systems. Recent trends in wireless networking and various access mechanism, new standards of wireless communication.
Exar	mination and Evalu	ation Pattern: It include both internal evaluation (30 marks) comprising two class
sess	ional exams/ assigr	ments/quiz/seminar presentation etc. and external evaluation (70 marks) which
is m	ainly end semester	examination.
Text	t Books:	
1	M. P. Clark, Wirele	ess Access Networks: Fixed Wireless Access and WLL networks Design and
	Operation, John W	/iley & Sons, Chichester
2	D. H. Morais, Fixed	d Broadband Wireless Communications: Principles and Practical Applications,
	Prentice Hall, Upp	er Saddle River
Refe	erence Books:	
1	R. Pandya, Introdu	uction to WLLs: Application and Deployment for Fixed and Broadband
	Services, IEEE Pr	ess, Piscataway.
•	•	

Course Co	ode			С	ourse T	itle			Leo	ture	Sam	ogtom
MTCS314I	РЕТ	Data Preparation and Analysis L T P Jun								ester.		
Version: 1.2			Date o	f Appro	<b>val:</b> 16tl	h BoS 17	-11-2022	2	4	0 0	1	.11
	Scheme o	of Instr	uction				S	cheme o	of Exar	ninatio	n	
No. of	Periods	: 60	Hrs.					Ма	ximum	Score	:	100
Periods	/ Week	Neek:4Internal Evaluation:30								30		
	Credits	: 4						E	End Sei	mester	:	70
Instructio	struction Mode  : Lecture Exam Duration  : 3 Hrs.											
Prerequisite(s)	: Machin	e Learn	ing and	Data M	lining							
Course Objecti	ves:	0										
1. To prepare	the data	for ana	lysis.									
2. To develop	meaning	gful Dat	a visual	lizations	S.	4 <b>.</b>	at at inti	l	1			
3. To Learn d	ata trans	dotogot	ons and	i segine	ntation	to solve	statisti	cal prob	lems			
4. To Create a	accurate	dataset	for app	blication	15.							
Course Outcon	les(CO):			54	atomor					Mon	nod Dro	drom.
COS NO.				51	latemer	IL				Out	comes (	POs)
CO ₁	Unders	tand tl	he dat	a parsi	ng and	l transf	ormatic	ns. and	l the		<b>PO</b> 1, <b>PO</b>	2
	differer	ice betv	veen da	ita and i	informa	tion wit	h forma	ts		_		
$CO_2$	Analyze	the bas	sic conc	ept of d	lata clea	ining for	valuabl	e inform	ation	PO	$P_2, PO_4, I$	PO ₆
	with a r	ninimu	m consi	stency	checkin	g.						
CO ₃	Unders	tand s	tatistic	al expl	oratory	analys	sis with	n hypot	hesis	PC	<b>94, PO</b> 7, 1	PO ₉
	generat	tion		11				1				DO
$CO_4$	Analyze	Analyze Design visualizations for exploratory analysis and <b>PO</b> ₃ , <b>PO</b> ₄ , <b>PO</b> ₅ , <b>PO</b> ₁₂										
	lacated	understand the concept of correlations and connections for geo										
<b>DO</b> . Engineerir	d Knowle	uata	D Dro	blom an	alveie I	<b>D</b> Dog	nign /dou	alonmon	t of s	lutions	<b>DO</b>	onduct
$PO_1$ - Engineering Knowledge, $PO_2$ - Problem analysis, $PO_3$ - Design/development of solutions, $PO_4$ - Conduct investigations of complex problems $PO_{r-}$ Modern tool usage $PO_{r-}$ The engineer and society $PO_{r-}$ Environment and												
sustainability, PC	8- Ethics,	PO ₉ - Ind	lividual o	or team v	vork, <b>PO</b> 1	₀- Comm	unicatio	n, <b>PO</b> 11- P	roject n	nanagem	ent and	finance,
PO12- Life-long L	earning				,			,	5	0		,
		Марр	ing of c	course c	outcome	es with p	orogram	outcom	les			
Course	PO,	PO	PO ₂	PO	POr	PO	PO ₇	PO	PO	PO ₁₀	PO	PO ₁₂
Outcomes	101	102	103	104	105	100	10/	10.	109	1010	IOn	1012
CO ₁	2	3										
CO ₂		2		3		2						
CO ₃				3			2		2			
CO ₄			2	2	2							2
			1 – Rea	isonable	e; 2 – Się	gnifican	t; 3 – St	rong				
Detailed Conte	ents:											
Unit: 1		Data Scalat	Gather: oility an	ing and d real-	l Prepa time iss	ration: I sues	Data foi	rmats, p	barsing	and tr	ansforr	nation,
Linite 0		Data	Cleanin	g: Cons	sistency	checki	ng, Het	erogene	ous ar	nd missi	ing data	a, Data
01111. 2		Trans	formati	on and	Segmer	ntation.						
Unit: 2		Explo	ratory	Analysis	s: Descr	riptive a	and con	nparativ	e stati	stics, C	lusterir	ng and
01111. 5		associ	iation, I	Hypothe	esis Gen	eration.						
Unit 4		Visual	ization	: Desig	ning y	visualiza	tions,	Time	series	, Geol	ocated	data,
01110. 4	Correlations and connections, Hierarchies and networks, interactivity.											
Unit: 5	Unit: 5 Ethics in the Profession: Cases in Computing, Statistics, Communication,											
	Professional Ethics Codes: ACM, IEEE, Am Stat. Assoc.											
<b>Examination and Evaluation Pattern:</b> It include both internal evaluation (30 marks) comprising two class												
sessional exam	s/ assign	ments/	quiz/	semina	r preser	ntation e	etc. and	external	evalua	tion (70	) marks)	which
is mainly end s	emester o	examina	ation.									
Text Books:		<b>D</b> : :		1 ~		. 1				1.5		1
1 Making s Glenn	ense of	Data: A	. practi	cal Gui	ide to E	explorat	ory Da	ta Analy	'sıs an	d Data	Mining	, by
2 The Vis	ual Disp	lay of	Quant	titative	e Infor	mation	, by Ec	lward	R. Tuf	`te		
Reference Boo	ks:	J	<u> </u>				· J					

1	Visualizing Data: Exploring and Explaining Data with Processing Environment, by
	Ben Fry
2	Exploratory Data Mining and Data Cleaning, by Tamraparni Dasu

Course Co	de			С	ourse T	itle			Leo	ecture		
MTCS315F	ΈT		0	ptimiza	ation T	echniqu	ies		L	Т Р	Sem	ester:
Version: 1.2			Date of	f Appro	<b>val:</b> 16t	h BoS 17-	-11-2022	2	4	0 0		111
	Scheme of	of Instr	uction				S	cheme o	of Exai	ninatio	n	
No. of	Periods	: 60	Hrs.					Ma	ximum	Score	:	100
Periods	/ Week	: 4						Intern	al Eva	uation	:	30
The set was a fire	Credits	: 4	- 4					E	Ind Sei	mester	:	2.11
Instructio Dronoguigito(g)	n Mode		ing					ΕΣ	am Di	iration	:	3 Hrs.
Course Objecti		e Learn	ing									
1 To provide	insight t	o the m	athema	tical for	mulati	on of rea	l-world	probler	ng			
2. To underst models.	and prob	olem for	mulatio	n by usi	ing line	ar, dynai	nic prog	grammir	ng, gan	ne theor	y and c	lueuing
3. To optimiz algorithms.	e this m	athema	tical sol	ution e	speciall	y useful	for NP-	-Hard p	roblen	ns using	nature	e-based
4. To introdu	ce operat	tion res	earch m	nodels u	sing op	timizatio	on techr	niques b	ased u	pon the	fundar	nentals
of engineer	ing math	nematic	s (minir	nizatior	and M	aximizat	ion of o	bjective	functi	on).		
Course Outcon	nes (CO):							2		,		
COs No.	× /			St	atemer	nt				Мар	ped Pro	ogram
										Out	comes	(POs)
CO ₁	Unders probler	tand aj ns invo	opropria lved in v	ate opti various i	mizatio industri	on metho ies.	od to so	olve cor	nplex	PC	<b>P</b> ₁ , <b>PO</b> ₂ ,	PO ₄
CO ₂	Analyze optimiz	e the ap the v	opropria arious p	ate algo program	rithm fe ming te	or alloca	tion of s.	resourc	es to	PC	3, PO4,	PO ₅
CO ₃	Unders	tand th	e conce	ept of th	neoretic	al worki	ngs of t	he grap	hical,	PC	4, PO ₆ ,	PO ₉
	simplex variable	x and $ar$	d analytical methods for making effective decision on									
CO ₄	Compre	ehend t	and the theoretical foundations of various issues related $PO_4$ , $PO_5$ , $PO_6$ , $PO_6$									)6. PO9
	to linea	linear programming modeling to formulate real-world problems									- 00, - 0	
	as a L P	model		,	0			1				
PO1- Engineerin	g Knowle	edge, P	0 ₂ - Prol	blem an	alysis, I	PO ₃ - Des	ign/dev	elopment	t of so	olutions,	PO ₄ - (	Conduct
sustainability, PC	complex 8- Ethics,	problem <b>PO</b> 9- Inc	s, <b>PO</b> ₅- M lividual c	Modern 1 or team w	tool usag vork, <b>PO</b>	ge, <b>PO</b> 6- '1 10- Comm	The engine unication	neer and n, <b>PO</b> 11- P	society roject n	7, <b>PO</b> 7- E nanagem	nvironm ent and	ient and finance,
PO12- LITE-TOTIg L	earning	Manr	ving of c	ourse o	utcome	e with n	rogram	outcom	ec			
Course		Mapp			ucom		logram	outcom				
Outcomes	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	<b>PO</b> ₇	PO ₈	PO ₉	<b>PO</b> ₁₀	<b>PO</b> ₁₁	<b>PO</b> ₁₂
CO ₁	3	2		2								
CO ₂			2	1	2							
CO ₃				2		2			2			
CO ₄				3	1	2			2			
			1 – Rea	isonable	; 2 – Sig	gnificant	; 3 – Sti	rong				
Detailed Conte	nts:											
Unit: 1	Introduction to Optimization: Engineering application of OptimizationStatement of an Optimization problem - Optimal Problem formulatioit: 1Classification of Optimization problem. Optimum design concepts: DefinitionGlobal and Local optima - Optimality criteria - Review of basic calculus conceptClabal optimality									ition – ation – ition of oncepts		
Linear Programming: Introduction and formulation of models, Conv Simplex method, BigM method, Two-phase method, Degeneracy, non-exi and unbounded solutions, revised simplex method, duality in LPP, dual sim method, sensitivity analysis, transportation and assignment problems, traveling salesman problem .Nonlinear Programming: Introduction and formulation of models, Cla								nvexity, existent simplex lassical				
Unit: 3		optim and K Wolfe	Nonlinear Programming: Introduction and formulation of models, Classical optimization methods, equality and inequality constraints, Lagrange multipliers and Kuhn-Tucker conditions, quadratic forms, quadratic programming problem, Wolfe's method.									

		Dynamic Programming: Principle of optimality, recursive relations, solution of LPP. Optimization algorithms for solving constrained optimization problems –							
	Unit: 4	direct methods application application methods at an etconect descent method							
		direct methods – penalty function methods – steepest descent method –							
		Engineering applications of constrained and unconstrained algorithms.							
		Integer Linear Programming: Gomory's cutting plane method, Branch and bound							
		algorithm, Knapsack problem, linear 0-1 problem. Modern methods of							
		Optimization: Genetic Algorithms - Simulated Annealing - Ant colony							
	Unit: 5	optimization - Tabu search - Neural-Network based Optimization - Fuzzy							
	Onit. 5	optimization tashnigues. Applications Use of Matlah to solve optimization							
		optimization techniques - Applications. Ose of Matiao to solve optimization							
		problems. Software: Introduction to software for optimization techniques							
		(TORA).							
Exar	mination and Evalua	ation Pattern: It include both internal evaluation (30 marks) comprising two class							
sess	ional exams/ assign	ments/quiz/seminar presentation etc. and external evaluation (70 marks) which							
is m	ainly end semester	examination.							
Text	t Books:								
1	Kanti Swarup, Mar	Mohan and P.K.Gupta, Introduction to Operations Research, S.Chand & Co.,							
	2006	1, 1, 1, ,							
2	IC Pant Introduc	tion to Operations Research Jain Brothers, New Delhi, 2008							
	J.C. I and, Introduce	tion to operations Research, sam brothers, New Denn, 2008							
Refe	erence Books:								
1	N.S.Kambo, Mathe	matical Programming Techniques, East-West Pub., Delhi, 1991.							
2	Maurice Saseini, Arhur Yaspan, Lawrence Friedman, "Operations Research: Methods &								
	Problems", 1 st Ed	ition, 1959.							

## **GENERIC ELECTIVES**

PCCS131GET         English For Research Paper Writing         I         T         P         P           Scheme of Instruction         Scheme of Scheme of Examination         1         100         Scheme of Examination           No. of Periods         :         60 Irrs.         Maximum Score         :         100           Periods/Week :         :         4         Instruction         :         30           Credits         :         3         Instruction         :         31           Course Objectives:         Instruction Mode         :         Lecture         Exam Data         :         314r.s.           1         Understand that who to improve your writing a Title Ensure the good quality of paper at very first-time submission.         :         314r.s.           2.         Learn about what to write in cach section.         :         Mapped Program Outcomes (CO):         Statement         Mapped Program Outcomes (POs)           CO         Understand the English for Writing Research Papers, Thesis.         POs, POs, POs, POs, POs, POs, POs, POs,	Course Co	ode			(	Course '	Title			Leo	ture				
Version: 1.2         Date of Approval: 16th BoS 17-11-2022         4         0         0           No. of Periods         :         60 Hrs.         Maximum Score         :         100           Periods/Week         :         30         End Semesor         :         100           Periods/Week         :         3         :         :         30           Credits         :         3         :         :         31           Prerequistlege/Basic knowledge of English         Exam Duration         :         3         Hrs.           Prerequistlege/Basic knowledge of English         Exam Duration         :         3         Hrs.           Course Objectives:         :         Learn Bout what to write in each section.         .         Mapped Program Outcomes (PO);           Cor         Understand the Skills needed when writing a Title Ensure the good quality of paper at very first-time submission.         PO ₀ , PO ₀	PGCS131C	ЪТ		Engli	sh For	Researc	h Paper	Writing		L	T P	Sem	ester: I		
Scheme of Instruction         Scheme of Barmarian           No. of Periods :         160 Hirs.         Maximum Score :         100           Periods/Week :         1         4         Internal Evaluation :         30           Instruction Mode :         1 Lecture :         End Semester :         70           Prerequisite(9): Basic know/Lectro of English         Exam Dout what to write in each section.         3 Hrs.           Outge Specifierse:         Internal Evaluation in the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.         Paper at very first-time submission.           Course Objectives:         Inderstand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.         PO ₀ , PO	Version: 1.2			Date of	of Appr	oval: 161	th BoS 17	7-11-2022		4	0 0				
No. of Periods         :         001 memory         i         100           Periods/Week         :         4         Internal Evaluation         :         30           Credits         :         3         End Sensester         :         31           Perequisite(S): Basic knowledge of English         Exam Duration         :         3 Hrs.           Prerequisite(S): Basic knowledge of English         Exam Duration         :         3 Hrs.           Inderstand that how to improve your writing skills and level of readability.         :         Improvement to the state of the		Scheme	of Inst	ruction				Sc	heme of	f Exam	inatio	1			
Periods/Weck         i         4         Internal Evaluation         i:         3           Instruction Mode         i:         Lecture         Exam Duration         i:         3         Instruction         70           Instruction Mode         i:         Lecture         Exam Duration         i:         3         Instruction         70           Prerequisite(s): Basic knowledge of English         Course Objectives:         Instruction Mode         i:         3         Instruction         i:         3         Instruction         i:         3         Instruction         i:         3         Instruction         i:         1:         Instruction         i:         3         Instruction         Inst	No. of	Periods	: 60	) Hrs.					Ma	ximum	Score	:	100		
	Periods	/ Week	: 4						Intern	al Eval	uation	:	30		
Instruction Mode [:]       Lecture       Exam Duration       :       3 Hrs.         Prerequisite(s): Basic knowledge of English         Course Objectives:         1.       Understand that how to improve your writing skills and level of readability.       Learn about what to write in each section.         3.       Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.       Course Outcomes (CO):         COrse Outcomes (CO):       COr       Understand the English for Writing Research Papers, Thesis.       POp, PO, PO, PO, PO, PO, PO, PO, PO, PO, PO		Credits	: 3						E	Ind Sei	nester	:	70		
Prerequisite(s): Basic knowledge of English Course Objectives:  1. Understand that how to improve your writing skills and level of readability. 2. Learn about what to write in each section. 3. Understand that skills needed when writing a Title Ensure the good quality of paper at very first-time submission. 4. Ensure the quality of paper at very first-time submission. Course Outcomes (CO):  COs No.  COs No.  COs No.  COs Show conciseness, clarity and avoid redundancy in writing. POs, POs, POs, POs, POs, POs, POs, OG.  COs Show conciseness, clarity and avoid redundancy in writing. COs No.  COs Show conciseness, clarity and avoid redundancy in writing. COs Show conciseness, clarity and avoid redundancy in writing. COs Show conciseness, clarity and avoid redundancy in writing. POs, POs, POs, POs, POs, POs, OG.  COs Summarize, evaluate literature, and write methodology, results and POs, POs, POs, POs, POs, POs, POs, POs,	Instructio	n Mode	: Le	ecture			Exam Duration : 3 Hrs.								
Course Objectives:         1. Understand that how to improve your writing skills and level of readability.         2. Learn about what to write in each section.         3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.         Course Outcomes (CO):         COs No.       Statement       Mapped Program Outcomes (POs)         CO       Understand the English for Writing Research Papers, Thesis.       Po, PO, PO, PO, PO, PO, PO, PO, OC2         Show conciseness, clarity and avoid redundancy in writing.       PO, PO, PO, PO, PO, CO2       Show conciseness, clarity and avoid redundancy in writing.       PO, PO, PO, PO, CO2         CO       Summarize, evaluate literature, and write methodology, results and PO, PO, PO, PO, PO, EOC.       Apply correct style of referencing and use punctuation appropriately.       PO, PO, ENC.         PO- Engineering Knowledge, POr - Problem analysis, POr- Design/development of solutions, POr - Conduct investigations of complex problems, POr Modern tool usage. POr The engineer and society. POr - Environment and finance.         POr - Engineering Knowledge, POr Individual or team work, PO ₈ POs	Prerequisite(	<b>s):</b> Basic I	knowle	dge of E	English										
1. Understand that how to improve your writing skills and level of readability.         2. Learn about what to write in each section.         3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.         4. Ensure the quality of paper at very first-time submission.         Course Outcomes (CO):         Outcomes (POs)         POo, POs, POs, POs, POs, Oo, POs, POs, POs, Oo         Coo:         Summarize, evaluate literature, and write methodology, results and poo, POs, POs, POs, POs, POs, POs, POs, POs	Course Objec	tives:													
2. Learn about what to write in each section.         3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.         4. Ensure the quality of paper at very first-time submission.         COarse Outcomes (CO):         COs No.         COs No.         CO2         Show conciseness, clarity and avoid redundancy in writing.         PO, PO2, PO3, PO4, PO3, PO4, PO3, PO4, PO3, PO4, PO3, PO4, PO3, PO4, CO3         Summarize, evaluate literature, and write methodology, results and conclusion conclusion conclusion appropriately.         PO- Engineering Knowledge, PO2, PO3- Po4 movel appropriately.         PO4, EO3         PO5, PO4, PO3, PO4, PO5, PO4         PO5, PO5, PO4         CO4       Apply correct style of referencing and use punctuation appropriately.         PO4, EIG-IDE learning         PO5, PO3, PO4, PO3, PO4, PO3, PO4, PO3, PO4, PO4, PO4, PO4, PO4, PO4, PO4, PO4	1. Understa	nd that h	ow to i	mprove	your w	riting s	kills and	level of re	eadabilit	y.					
<ul> <li>Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.</li> <li>Ensure the quality of paper at very first-time submission.</li> <li>Course Outcomes (CO):</li> <li>COs No.</li> <li>Statement</li> <li>Understand the English for Writing Research Papers, Thesis.</li> <li>PO₀, PO₂, PO₃, PO₄,</li> <li>CO₂</li> <li>Show conciseness, clarity and avoid redundancy in writing:</li> <li>PO₃, PO₄, PO₅, PO₆,</li> <li>CO₂</li> <li>Show conciseness, clarity and avoid redundancy in writing:</li> <li>PO₃, PO₄, PO₅, PO₆,</li> <li>PO₅</li> <li>CO₄</li> <li>Apply correct style of referencing and use punctuation appropriately.</li> <li>PO₆ = Do₁₀, PO₁₂, PO₂</li> <li>PO₆ = PO₁₀, PO₂ = PO₃, PO₆ = PO₂ = Design/development of solutions, PO₇ = Conduction of complex problems, PO₇ = Modern tool usage, PO₇. The enfineer and society, PO₇ = Environment and sustainability. PO₇ = Enkics, PO₇ = Individual or team work, PO₈ = PO₇ = PO₈ = PO₉ = PO₁₀ = PO₁₁ = PO₁₂ = PO₁₂ = PO₂₁ = PO₂₁ = PO₂₂ = PO</li></ul>	2. Learn abo	ut what	to write	e in eacl	h sectio	n.									
Submission.       4. Ensure the quality of paper at very first-time submission.       Mapped Program Outcomes (CO):         Course Outcomes (CO):         Conse Outcomes (CO):         Outcomes (CO):         Outcomes (CO):         Outcomes (CO):         Outcomes (POs)         Oot         Oot       Sot <t< td=""><td>3. Understa</td><td>nd the sk</td><td>tills nee</td><td>ded wh</td><td>en writ</td><td>ing a Ti</td><td>tle Ensu</td><td>re the goo</td><td>od qualit</td><td>y of pa</td><td>aper at</td><td>very fir</td><td>st-time</td></t<>	3. Understa	nd the sk	tills nee	ded wh	en writ	ing a Ti	tle Ensu	re the goo	od qualit	y of pa	aper at	very fir	st-time		
Course Outcomes (CO):       Statement       Mapped Program Outcomes (COs)         COs No.       Vinderstand the English for Writing Research Papers, Thesis.       PO ₁ , PO ₂ , PO ₃ , PO ₄ , PO ₆ , PO ₆ , PO ₇ , PO ₈ CO2       Show conciseness, clarity and avoid redundancy in writing.       PO ₂ , PO ₃ , PO ₄ , PO ₅ , PO ₆ , PO ₇ , PO ₆ , PO ₇ , PO ₈ CO3       Summarize, evaluate literature, and write methodology, results and conclusion       PO ₂ , PO ₃ , PO ₄ , PO ₅ , PO ₇ , PO ₈ , PO ₉ , PO ₁₀ , PO ₁₂ PO4       Apply correct style of referencing and use punctuation appropriately.       PO ₁₀ , PO ₁₂ PO5       Fobiem analysis, PO5       Design/development of solutions, PO4       PO6, PO7         PO4       PO2       PO3       PO4       PO5       PO6       PO7       PO8       PO9       PO1       PO12         CO4       Apply portect style of course outcomes with program outcomes       Vintersent and finance, PO3       PO1       PO12       PO2       PO3       PO4       PO5       PO6       PO7       PO8       PO9       PO10       PO12       PO12       CO2       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I	submissio	n.	0		<b>C1</b>										
Course Outcomes (CO):         Statement       Mapped Program Outcomes (POs)         CO1       Understand the English for Writing Research Papers, Thesis.       PO1, PO2, PO4, PO3, PO4, PO3, PO4, Octomes (POS)         CO2       Show conciseness, clarity and avoid redundancy in writing.       PO3, PO4, PO3, PO4, PO3, PO4, Octomes (POS)         CO3       Summarize, evaluate literature, and write methodology, results and conclusion       PO2, PO3, PO4, PO3, PO4, PO3, PO4, PO5, PO4, PO5, PO5, PO5, PO5, PO5, PO5, PO5, PO5	4. Ensure th	e quality	of pape	er at vei	ry first-	time su	bmissior	1.							
COs No.       Mapped Program Outcomes (POs)         CO1       Understand the English for Writing Research Papers, Thesis.       POi, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs, POs,	Course Outco	mes (CO	):			<u>a.</u>						1.5			
CO     Understand the English for Writing Research Papers, Thesis.     POthology, POth	COs No.					Statem	ent				Ma	pped P	cogram		
Poly,	<u> </u>	Undong	tondth	o En elia	h for W	witing D	lagaarah	Donora T	hogia			itcomes	s (POS)		
CO2       Show conciseness, clarity and avoid redundancy in writing.       POa, POa         CO3       Summarize, evaluate literature, and write methodology, results and conclusion       POa, POa, POa, POa, POa, POa         CO4       Apply correct style of referencing and use punctuation appropriately.       POb, POa       POb, POa         POr- Engineering Knowledge, POr- Problem analysis, POa- Design/development of solutions, PO4- Conduct investigations of complex problems, PO6- Modern tool usage, POa- The engineer and society, PO- Environment and sustainability, POa- Ethics, POa- Individual or team work, POa- Communication, POn- Project management and finance, POar Learning         Course       Mapping of course outcomest with program outcomest         CO4       3       2       POa       POa       POa       POa       POn       POn <td></td> <td>Unders</td> <td>tand th</td> <td>e Englis</td> <td>II IOF W</td> <td>riting R</td> <td>lesearch</td> <td>Papers, I</td> <td>nesis.</td> <td></td> <td>F</td> <td>O₁, PO₂</td> <td>$, PO_{6},$</td>		Unders	tand th	e Englis	II IOF W	riting R	lesearch	Papers, I	nesis.		F	O ₁ , PO ₂	$, PO_{6},$		
CO2       Diversities charty and avoid redundarity in writing.       Pos, Po4, Po4, PO5, PO4, O25, PO5, PO5, PO5, PO5, PO5, PO5, PO5, PO	CO.	Show	ancison		rity on	lavoidr	odundar	ow in wri	ting				)		
Cord       Spininalize, evaluate include, and write includology, results and possible conclusion       POs, pos, POs, POs, POs, appropriately.         CO       Apply correct style of referencing and use punctuation appropriately.       POne, possible conclusion       POs, Conclusion       PO		Summa	rizo or	ess, cia	litoratu	ro and	write r	othodolo	ung.	ilta on	d D	$PO_3, PO_2$			
Tog appropriately.         PO1-       Engineering       Knowledge, PO2-       Problem analysis, PO3-       Design/development of solutions, PO4-       Control         investigations of complex problems, PO3-       Modern tool usage, PO6-       The engineer and society, PO7-       Environment and sustainability, PO4-       Environment and sustainability, PO5-       Environment and finance, PO1-         PO1-       Life-long Learning       Mapping of course outcomes with program outcomes       Image: PO6-       PO1-       PO2       PO2-       PO1-       PO1- <t< td=""><td></td><td>conclus</td><td>ion</td><td>aluate</td><td>iiteiatu</td><td>ie, anu</td><td>write ii</td><td>lethouoid</td><td>gy, iest</td><td>ints an</td><td>u r</td><td>02, PO3</td><td>, PO4,</td></t<>		conclus	ion	aluate	iiteiatu	ie, anu	write ii	lethouoid	gy, iest	ints an	u r	02, PO3	, PO4,		
Point       Projection of the intervention of a data are painted at the	CO	Apply c	orrect	style of	referen	cing an	d use nu	nctuation					2013		
POr- Engineering Knowledge, PO2- Problem analysis, PO3- Design/development of solutions, PO4- Conduct investigations of complex problems, PO5- Modern tool usage, PO6- The engineer and society, PO7- Environment and sustainability, Po5- Ethics, PO9- Individual or team work, PO60- Communication, PO8- Project management and finance, PO12- Life-long Learning         Wapping of course outcomes with program outcomes         Course Outcomes       PO1       PO2       PO3       PO4       PO5       PO6       PO7       PO8       PO9       PO11       PO12         Course Outcomes       PO1       3       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       1       2       2       1       2       2       1       2       1       2       1       2       1       2       1       2       1       2       1       2       1       2       1       1       1       1       1       1       1       1       1       2       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1	004	appropriately										012			
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sustainability, PO ₈ - Ethics, PO ₉ - Individual or team work, PO ₁₀ - COmmunication, PO ₁₁ - Project management and finance, PO ₁₂ Life-long Learning           Mage: Life-long Learning           Visite         Mage: PO ₁ PO ₂ PO ₃ PO ₄ PO ₅ PO ₆ PO ₇ PO ₈ PO ₉ PO ₁₀ PO ₁₁ PO ₁₂ Course Outcomes         PO ₁ PO ₂ PO ₃ PO ₄ PO ₅ PO ₆ PO ₇ PO ₈ PO ₉ PO ₁₀ PO ₁₁ PO ₁₂ CO ₁ 3         2         2         2         2         2         2         2         2         2         2         2         2         2         2         1         2         2         2         1         2         2         1         2         2         1         2         1         2         1         2         1         2         1         2         1         2         1         2         1         2         1           CO ₂ 1         1         1         2         2 <th 2"2"2"2"2"2"2"2"2"2"2"2"2"2"2"2"2"2<="" colspan="2" td=""><td>investigations of</td><td colspan="11">investigations of complex problems, <b>PO₅</b>- Modern tool usage, <b>PO₆</b>- The engineer and society, <b>PO₇</b>- Environment and</td></th>	<td>investigations of</td> <td colspan="11">investigations of complex problems, <b>PO₅</b>- Modern tool usage, <b>PO₆</b>- The engineer and society, <b>PO₇</b>- Environment and</td>		investigations of	investigations of complex problems, <b>PO₅</b> - Modern tool usage, <b>PO₆</b> - The engineer and society, <b>PO₇</b> - Environment and											
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Refe	erence Books:
1	Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book
2	Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg
	London, 2011.

Course C	ode			(	Course '	Title			Lecture					
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Version: 1.2			Date o	of Appro	oval: 161	th BoS 17	-11-2022		4	0 0				
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No. of	Periods	: 60	) Hrs.					Ma	ximum	Score	: 1	00		
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Course Object	sj. Data s tives:	uctui	e a Aigi	511011115										
1. To learn	to demo	nstrate	a criti	cal und	lerstand	ting of k	ev conce	epts in	disaste	er risk	reductio	on and		
humanita	rian resp	onse.	u 01101	cui uno	or obtained		log conce	-p to 111	aisast		caacon	on una		
2. To critica	lly evalu	ate dis	aster ri	sk redu	ction a	nd hum	anitarian	respons	se poli	cy and	practic	e from		
multiple p	perspecti	ves.						-	-	c .	-			
3. To develo	p an und	erstand	ing of st	andard	s of hur	nanitaria	in respons	se and p	ractica	al releva	nce in s	pecific		
types of d	types of disasters and conflict situations.													
4. To critica	lly under	stand t	he strer	igths ar	nd weak	inesses o	f disaster	manag	ement	approa	ches, pl	anning		
and progr	ramming	in diffe	rent co	untries	, partici	ularly the	eir nome	country	or the	e count	ries the	y work		
	mes (CO	).												
COs No	mes (co	<i>)</i> .		S	tateme	nt				Man	ned Pro	oram		
003 110.				, D	cateme	110				Out	comes (	POs)		
CO ₁	Explain	disast	er man	agemer	t theo	rv (cvcle	e, phases	, risk, o	crisis,		PO ₆ , PO	<u>- 02)</u> 7		
	emerge	ncy, dis	asters,	resilien	ce).	5 ( 5	, <u>1</u>	, ,	,					
CO ₂	Create	Techn	ological	l innov	ations	in Disa	ster Risł	c Redu	ction:	<b>PO</b> ₁ ,	PO ₂ , PO	4, <b>PO</b> 5		
	Advanta	ages and	d proble	ems.										
CO ₃	Evaluat	e DM st	e DM study including data search, analysis and PO ₂ , PO3, PO ₅											
	present	ation a	on as a case study.											
CO ₄	Apply k	nowled	lge abo	ut exis	ting glo	obal fran	neworks	and ex	isting	PO	7, <b>PO</b> 10, 1	PO ₁₂		
	agreem	ents ar	nd role	of cor	nmunit	y in suc	cessful I	Jisaster	RISK					
<b>PO</b> ₁ - Engineer	ing Know	dedge.	PO ₂ - Pr	oblem a	analysis.	<b>PO</b> 3- D	esign/deve	elopment	t of so	olutions.	PO4- (	Conduct		
investigations of	of complex	c proble	ms, <b>PO</b> ₅-	Modern	n tool us	age, PO ₆ -	The engir	neer and	society	, <b>РО</b> 7- Е	nvironm	ent and		
sustainability, <b>F</b>	O ₈ - Ethics	5, <b>PO</b> 9- II	ndividual	or team	work, <b>P</b>	0 ₁₀ - Com	munication	n, <b>PO</b> 11 ⁻ P	roject n	nanagen	ent and	finance,		
PO ₁₂ - Life-long	Learning	Mor	ning of	COLLEGO	outcor	nog with	program	outcom	00					
Course		Maj	ping of	course	outcon		program	outcom	les					
Outcomes	PO ₁	$PO_2$	PO ₃	$PO_4$	$PO_5$	$PO_6$	$PO_7$	PO ₈	PO ₉	<b>PO</b> ₁₀	<b>PO</b> ₁₁	<b>PO</b> ₁₂		
CO ₁						1	2							
CO ₂	2	3		1	1									
CO ₃		1	2		1									
CO ₄							2			2		2		
			1 – Re	easonab	le; 2 – S	Significa	nt; 3 - Str	ong						
Detailed Cont	tents:													
		Introc	luction	Disaste	er: Defii	nition, Fa	actors an	d Signif	icance	; Differ	ence Be	etween		
Unit: 1		Hazar	d and L	Disaster	; Natur	al and M	anmade I	Disaster	s: Diffe	erence,	Nature,	Types		
		and N	lagnituc	$\frac{10}{2}$	aaatama	and Har	anda: Eaa	nomio I	Jamaa	. I	of Llum	on and		
		Anim	Cussion	S OI DI Destr	sasters	of For	arus: Eco	Notur	Jamag J Die	e, Loss	OI HUIII Forthe	an anu		
Unit [.] 2	,	Volca	nisms (	Velone	s Tsun	amis Flo	ods Dro	nohts a	nd Fai	nines l	andslid	es and		
Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Inc								. Indust	rial Acc	idents.				
		Oil Sli	cks and	Spills,	Outbrea	aks of Di	seases an	d Epide	mics, V	Nar and	Conflic	ets.		
		Disast	er Pron	e Areas	s in Indi	a Study (	Of Seismi	c Zones	; Areas	s Prone	To Floo	ds And		
Unit: 3	R	Droughts, Landslides and Avalanches; Areas Prone To Cyclonic And Coastal												
	Hazards With Special Reference To Tsunami; Post Disaster Diseases And													
		Epidemics												
Unit: 4	ļ	Disast	er Prep	aredne	ss and M	Managen	ient Prepa	arednes	s: Mon	itoring	ot Phen	omena		
		Trigge	ering A	Disast	er Or	Hazard;	Evaluatio	on of R	isk: Aj	pplicati	on of F	kemote		

		Sensing, Data From Meteorological And Other Agencies, Media Reports:										
		Governmental And Community										
		Preparedness.										
		Risk Assessment Disaster Risk: Concept and Elements, Disaster Risk Reduction,										
		Global and National Disaster Risk Situation. Techniques Of Risk Assessment,										
	Global Co-Operation in Risk Assessment and Warning, People's Participation											
	Unit: 5 Risk Assessment. Strategies for Survival. Disaster Mitigation Meaning, Concep											
		and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural										
		Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in										
		India.										
Exar	nination and Eval	uation Pattern: It include both internal evaluation (30 marks) comprising two class										
sess	ional exams/ assig	gnments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which										
is m	ainly end semester	r examination.										
Text	: Books:											
1	Sahni, Pardeep e	t.al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall										
	Of India, New De	lhi.										
2	Goel S. L., Disast	ter Administration and Publication Pvt. Ltd., New Delhi.										
Refe	erence Books:											
1	R. Nishith, Singh	AK, "Disaster Management in India: Perspectives, issues and strategies "New Royal										
	book Company.											

PGCS133	Course Code Cour								Lec	ture				
222230	GET		Sans	skrit for	[.] Techni	cal Knov	wledge		L	Т Р	Seme	ster: I		
Version: 1.2			Date o	of Appro	oval: 16t	h BoS 17	-11-2022		4	0 0				
	Scheme	of Inst	ruction				Sc	heme o	f Exam	ination	L			
No. of	Periods	: 60	) Hrs.					Ma	ximum	Score	: 1	00		
Periods	/ Week	: 4				Internal Evaluation : 30								
	Credits	: 4				End Semester : 70								
Instructio	n Mode	: Le	ecture					Ех	am Du	iration	: 3	3 Hrs.		
Prerequisite	<b>s):</b> Discre	te Mat	hematic	S										
Course Objec	tives:	1	Lata 1				- ' 1 (° 1			1.1				
1. To get a v	vorking k	nowled	ige in ill provo b	ustrious	s Sanski	rit, the so	cientific l	anguage	e in the	e world.				
2. Learning	of Sanski	rit to fi	iprove b levelon	the log	ic in m	ig. athemat	ice scien	ce & of	hor su	hiects (	anhanci	ng tha		
5. Learning	memory power													
4 The engin	neering s	cholars	equipp	ed with	ı Sansk	rit will h	e able to	explor	e the l	nuge kn	owledge	e from		
ancient li	terature.	enoiure	equipp		i bullon		te ubie te	enpior	e une i	luge kii	omeag	e nom		
Course Outco	omes (CO	):												
COs No.		/		S	tateme	nt				Map	ped Pro	gram		
Outcomes										comes (	(POs)			
CO ₁	Unders	standiı	ng basio	c Sansk	rit Lan	guage.				]	PO ₆ , PC	<b>)</b> 7		
CO ₂	Unders	stand	Ancien	t Sansl	krit lite	erature	about s	science	and	PO	1, <b>PO</b> ₆ , 1	PO ₇ ,		
	techno	echnology PO ₁₂												
CO ₃	Being 1	ogical	langua	ge will	help to	develo	p logic i	n stude	ents.	PO	. PO ₉ . I	PO ₁₀ .		
	PO ₁₂										- 10,			
CO ₄	Correl	ate the	Sanski	rit man	uscrip	ts with	Engineer	ring		PO	<u> </u>	PO		
PO ₁ - Engineer	<b>PO</b> ₁ - Engineering Knowledge, <b>PO</b> ₂ - Problem analysis, <b>PO</b> ₃ - Design/development of solutions, <b>PO</b> ₄ - Conduct													
investigations of complex problems, <b>PO</b> ₅ - Modern tool usage, <b>PO</b> ₆ - The engineer and society, <b>PO</b> ₇ - Environment and														
sustainability, <b>PO₈</b> - Ethics, <b>PO₉</b> - Individual or team work, <b>PO₁₀</b> - Communication, <b>PO₁₁</b> - Project management and finance,										, <b>РО</b> 7- Е	nvironm	ent and		
sustainability, l	O ₈ - Ethics	s, <b>PO</b> 9- I	ndividual	l or team	work, <b>P</b>	age, <b>PO</b> 6- <b>D</b> 10- Comr	The engir nunicatior	neer and n, <b>PO₁₁-</b> P	society roject n	r, <b>PO</b> 7- E nanagem	nvironm ent and f	ent and finance,		
sustainability, <b>I</b> <b>PO</b> 12- Life-long	<b>O</b> 8- Ethics Learning	S, <b>PO</b> ₉ - I	ndividual	l or team	work, P	age, <b>PO</b> 6- <b>D</b> 10- Comr	The engin	neer and n, <b>PO</b> ₁₁ - P	society roject n	7, <b>PO</b> 7- E nanagem	nvironmo ent and f	ent and finance,		
sustainability, l PO ₁₂ - Life-long	PO ₈ - Ethics Learning	s, <b>PO</b> 9- I Maj	ndividual	or team	outcon	age, <b>PO</b> 6- D10- Comr nes with	The engir municatior program	neer and n, <b>PO</b> 11- P outcom	society roject n ies	7, <b>PO</b> 7- E nanagem	nvironme ent and f	ent and finance,		
sustainability, l PO ₁₂ - Life-long Course Outcomes	PO ₈ - Ethics Learning PO ₁	5, <b>PO</b> ₉ - I Maj <b>PO</b> ₂	ping of <b>PO</b> ₃	r team	outcon	age, PO ₆ - D ₁₀ - Comr nes with PO ₆	The engir municatior program <b>PO</b> 7	neer and n, <b>PO</b> 11- P outcom <b>PO</b> 8	society roject n ros PO ₉	7, <b>PO</b> 7- E nanagem <b>PO</b> 10	nvironmo ent and f <b>PO</b> 11	ent and finance,		
Sustainability, I PO ₁₂ - Life-long Course Outcomes	PO ₈ - Ethics Learning PO ₁	s, <b>РО</b> 9- I Мар <b>РО</b> 2	ping of PO ₃	r team	outcon PO ₅	age, $PO_{6}$ - $O_{10}$ - Commense with $PO_{6}$	The engir nunicatior program <b>PO</b> 7	neer and h, <b>PO</b> ₁₁ - P outcom <b>PO</b> ₈	society roject n es PO ₉	7, PO7- E nanagem PO ₁₀	nvironmo ent and f PO ₁₁	ent and finance, PO ₁₂		
Sustainability, I PO12- Life-long Course Outcomes CO1 CO2	PO ₈ - Ethics Learning PO ₁	5, <b>PO</b> 9- I Maj <b>PO</b> 2	pping of PO ₃	rouch lor team rourse PO ₄	outcon PO ₅	age, $PO_{6}$ - $O_{10}$ - Commes with $PO_{6}$ 2 2	The engin nunication program PO ₇ 3 2	outcom PO ₁₁ - P Outcom PO ₈	society roject n es PO ₉	7, PO ₇ - E nanagem PO ₁₀	nvironmo ent and f PO ₁₁	ent and finance, PO ₁₂		
Sustainability, I PO ₁₂ - Life-long Course Outcomes CO ₁ CO ₂ CO ₃	PO ₈ - Ethics Learning PO ₁	S, PO ₉ - I Maj PO ₂	pping of PO ₃	PO ₄	outcon PO ₅	age, $PO_{6}$ - $O_{10}$ - Commenses with $PO_{6}$ 2 2	The engir nunicatior program PO ₇ 3 2	outcom PO ₈	society roject n es PO ₉	r, PO ₇ - E nanagem PO ₁₀	PO ₁₁	ent and finance, PO ₁₂ 2 2		
Course Outcomes CO1 CO2 CO3 CO4	PO ₈ - Ethics Learning PO ₁ 2 3	s, <b>РО</b> ₉ - I Мај <b>РО</b> 2	PO ₃	PO ₄	outcon PO ₅	age, $PO_{6}$ - $O_{10}$ - Commenses with $PO_{6}$ 2 2 2	The engir nunicatior program PO ₇ 3 2	outcom PO ₈	society roject n es PO ₉ 2	PO ₇ - E nanagem PO ₁₀	PO ₁₁	ent and finance, PO ₁₂ 2 2 2 2 2		
Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄	PO ₈ - Ethics Learning PO ₁ 2 3	Maj PO ₂	PO ₃ 1 – Re	PO ₄	$PO_5$ $PO_5$ 3 le; 2 - S	age, $PO_{6}$ - $O_{10}$ - Commenses with $PO_{6}$ 2 ignificar	The engir nunication program PO ₇ 3 2 2 nt; 3 – Str	outcom PO ₈	PO ₉	PO ₁₀ PO ₁₀	PO ₁₁	ent and finance, PO ₁₂ 2 2 2 2 2		
Sustainability, 1 PO ₁₂ - Life-long Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Con	PO ₈ - Ethics Learning PO ₁ 2 3 tents:	Maj PO ₂	PO ₃ 1 – Re	PO ₄	outcon PO ₅ 3 3 le; 2 - S	age, PO ₆ - O ₁₀ - Commes with PO ₆ 2 2 ignificar	The engir nunication program PO ₇ 3 2 2 nt; 3 – Sta	outcom PO ₈	society roject n ees PO ₉ 2	r, <b>PO</b> ₇ - E nanagem <b>PO</b> ₁₀	PO ₁₁	ent and finance, PO ₁₂ 2 2 2 2		
Sustainability, I PO ₁₂ - Life-long Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Con Unit:	PO ₈ - Ethics Learning PO ₁ 2 3 tents:	PO ₂ Alpha	PO ₃ 1 – Rebets in S	PO4 easonab	outcon PO ₅ 3 3 1e; 2 - S	age, PO ₆ - O ₁₀ - Commense with PO ₆ 2 2 ignificar	The engin nunication program PO7 3 2 nt; 3 – Str /Future T	outcom PO ₈ PO ₈ Cong	PO ₉	PO ₁₀ PO ₁₀ 2 Sentence	PO ₁₁ es.	ent and finance, PO ₁₂ 2 2 2 2 2		
Sustainability, I PO ₁₂ - Life-long Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Con Unit: 2	PO ₈ - Ethics Learning PO ₁ 2 3 tents: 1 2	Alpha Order	PO ₃ PO ₃ 1 – Re bets in S	PO4 PO4 Banskrif	outcon PO ₅ 3 3 le; 2 - S	age, PO ₆ - D ₁₀ - Commension PO ₆ 2 2 ignifican Present/	The engir nunication program PO ₇ 3 2 nt; 3 – Str /Future T	outcom PO ₁₁ - P PO ₈ PO ₈	PO9 2 mple S	PO ₁ - E nanagem PO ₁₀ 2 Sentence	PO ₁₁	ent and finance, PO ₁₂ 2 2 2 2		
Sustainability, I PO ₁₂ - Life-long Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Con Unit: 2 Unit: 2	PO ₈ - Ethics Learning PO ₁ 2 3 tents: 1 2 3	Alpha Order Techn	PO ₃ 1 – Re bets in S , Introd	PO4 PO4 Easonab	outcon PO₅ 3 3 1e; 2 - S t, Past/ of roots on about	age, PO ₆ - D ₁₀ - Comr nes with PO ₆ 2 2 ignificar Present/	The engir nunication program PO ₇ 3 2 nt; 3 – Str /Future T t Literatu	outcom PO ₁₁ - P PO ₈ PO ₈ Cong	PO9 2 mple S	PO ₁ - E nanagem PO ₁₀ 2 Sentenc	PO ₁₁	ent and finance, PO ₁₂ 2 2 2 2 2		
Sustainability, 1 PO ₁₂ - Life-long Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Con Unit: 2 Unit: 2	PO ₈ - Ethics Learning PO ₁ 2 3 tents: 1 2 3	Alpha Order Techn	1 – Ra bets in S r, Introd nical infe	PO4 PO4 Easonab	vork, P0 outcon PO₅ 3 3 3 le; 2 - S t, Past/ of roots m about of Engin	age, PO ₆ - D ₁₀ - Comr nes with PO ₆ 2 2 ignificar Present/	The engin nunication program PO ₇ 3 2 nt; 3 - Str /Future T t Literatu Electrical	outcom PO ₁ - P Outcom PO ₈ outcom	society roject n es PO ₉ 2 2 imple S	PO ₁₀ PO ₁₀ 2 Sentence	PO ₁₁ es.	ent and finance, PO ₁₂ 2 2 2 2		
Sustainability, 1 PO ₁₂ - Life-long Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Con Unit: 2 Unit: 2 Unit: 4	PO ₈ - Ethics Learning PO ₁ 2 3 tents: 1 2 3	Alpha Order Techn Math	1 – Re bets in S r, Introd nical info ematics.	PO4 PO4 Easonab Sanskrit	vork, PG outcon PO5 3 3 <i>ie</i> ; 2 - S <i>ie</i> ; 2 - S <i>ie</i> ; 2 - S <i>ie</i> ; 2 - S	age, PO ₆ - D ₁₀ - Comr nes with PO ₆ 2 2 ignificar Present/ Sanskri eering-F	The engin nunication <b>PO</b> 7 3 2 <b>nt; 3 – Sta</b> /Future T t Literatu	outcom PO ₈ PO ₈ Cense, Si ure.	PO9 2 mple S	PO ₁₀ PO ₁₀ 2 Gentence	PO ₁₁ es.	ent and finance, PO ₁₂ 2 2 2 2		
Sustainability, 1 PO ₁₂ - Life-long Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Con Unit: 2 Unit: 2 Unit: 4	PO ₈ - Ethics Learning PO ₁ 2 3 tents: 1 2 3 4	Alpha Order Techn Math Litera	1 – Re bets in S c, Introd nical infe incal con ematics.	PO4 PO4 Easonab Sanskrift Luction ormation cormation Sanskrift	vork, Po outcon PO ₅ 3 3 le; 2 - S t, Past/ of roots on about of Engin t and w	age, PO ₆ - Con- Comr PO6 2 2 2 ignificar Present/ Sanskri eering-F	The engin nunication program PO ₇ 3 2 <i>t</i> ; <b>3 – St</b> /Future T t Literatu Electrical.	outcom PO ₁₁ - P Outcom PO ₈ Cong Cense, Si are.	PO9 2 mical, A	PO ₁₀ PO ₁₀ 2 Gentence	PO ₁₁ es.	ent and finance, PO ₁₂ 2 2 2 2		
Sustainability, I PO ₁₂ - Life-long Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Con Unit: 2 Unit: 2 Unit: 2 Unit: 4	PO ₈ - Ethics Learning PO ₁ 2 3 tents: 1 2 3 4 5 and Eval	Alpha Order Techn Math Litera uation	1 – Re bets in S r, Introd nical con ematics.	PO4 PO4 Banskrit luction Sanskrit Sanskrii : It inch	outcon PO₅ 3 3 1e; 2 - S 1e; 2 - S 1e	age, PO ₆ - D ₁₀ - Comr nes with PO ₆ 2 2 ignificar Present/ Sanskri eering-F riting. h interna	The engin munication program PO ₇ 3 2 <i>sti</i> ; 3 – Sti /Future T t Literatu Electrical	rong	society roject n ees PO ₉ 2 2 mple S nical, A marks)	PO ₁ o PO _{10 2 Centence Comprise Compri}	PO ₁₁ ess.	PO ₁₂ 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		
Sustainability, 1 PO ₁₂ - Life-long Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Con Unit: 2 Unit: 2 Unit: 4 Unit: 4 Examination sessional examination	PO ₈ - Ethics Learning PO ₁ 2 3 tents: 1 2 3 4 5 and Evalues ms/ assignments	Alpha Order Techn Litera uation	1 – Re bets in S r, Introd nical infe nical cor ematics. ture of Pattern s/ quiz/	PO4 PO4 Easonab Sanskrit luction ormatio neepts o Sanskri : It inclu	vork, P outcon PO₅ 3 3 3 1e; 2 - S t, Past/ of roots n about of Engin t and w ude bot ar prese	age, PO ₆ - D ₁₀ - Comr nes with PO ₆ 2 2 ignificar Present/ Sanskri eering-F riting. h interna entation	The engin munication program PO ₇ 3 2 xt; 3 – Str /Future T t Literatu Electrical	outcom PO ₁₁ - P outcom PO ₈ PO ₈ Cong Conse, Si ure. , Mecha ion (30 external	society roject n es PO ₉ 2 2 mple S nical, <i>A</i> evalua	PO ₁₀ PO ₁₀ 2 Sentence Comprise Compr	PO ₁₁ es. es. eture, ising tw marks)	PO ₁₂ 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		
Sustainability, I PO ₁₂ - Life-long Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Con Unit: 2 Unit: 2 Unit: 4 Unit: 4 Unit: 5 Examination sessional examination	PO ₈ - Ethics Learning PO ₁ 2 3 tents: 1 2 3 4 5 and Eval ms/ assig semester	Alpha Order Techn Math Litera uation	1 – Re bets in S r, Introd nical cor ematics. ture of Pattern s/ quiz/ nation.	PO4 PO4 easonab Sanskritt luction ormatio neepts o Sanskri : It inclu	vork, P outcon PO5 3 3 3 <i>ie</i> ; 2 - S <i>ie</i> ; 2 - S	age, PO ₆ - D ₁₀ - Comr nes with PO ₆ 2 2 ignificar Present/ Sanskri eering-H riting. h interna entation	The engin munication program PO7 3 2 t; 3 - Str /Future T t Literatu Electrical al evaluat etc. and e	outcom PO ₁₁ - P PO ₈ PO ₈ Cong Cense, Si re. , Mecha	society roject n es PO ₉ 2 imple S nical, <i>A</i> evalua	PO ₁₀ PO ₁₀ 2 Sentence	PO ₁₁ es. es.	ent and finance, PO ₁₂ 2 2 2 2 2 2 0 c class which		
Sustainability, I PO ₁₂ - Life-long Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Con Unit: 2 Unit: 2 Unit: 2 Unit: 4 Unit: 4 Unit	PO ₈ - Ethics Learning PO ₁ 2 3 tents: 1 2 3 4 5 and Eval ms/ assig semester	Alpha Order Techn Math Litera <b>uation</b> gnment	1 – Re bets in S c, Introd nical info ical con ematics. ture of Pattern s/ quiz/ nation.	PO4 PO4 Easonab Sanskrit Luction Sanskrit Sanskrit Luction Sanskrit Luction Sanskrit Sanskrit	vork, PG outcon PO5 3 3 <i>it</i> , Past/ of roots on about of Engin t and w ude bot ar prese	age, PO ₆ - Comment PO ₆ 2 2 ignifican Present Sanskri eering-F riting. h interna	The engin munication program PO7 3 2 1 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2	rong POs POs POs POs POs POs POs Ponse, Si Ponse, Ponse, Po	society roject n es PO ₉ 2 2 mple S morks) evalua	PO ₁₀ PO ₁₀ 2 Gentence Comprise Compr	ent and f PO ₁₁ es. es. eture, ising tw marks)	ent and finance, PO ₁₂ 2 2 2 2 2 2 2 0 vhich		
Sustainability, I PO ₁₂ - Life-long Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Con Unit: 2 Unit: 2 Unit: 2 Unit: 2 Examination sessional examinis mainly end Text Books: 1 "Abhyas	PO ₈ - Ethics Learning PO ₁ 2 3 tents: 1 2 3 4 5 and Eval ms/ assig semester pustakan	Alpha Order Techn Math Litera <b>uation</b> (nment exami	1 - Re bets in S c, Introd nical infe nical con ematics. ture of Pattern s/ quiz/ nation.	PO4 PO4 Banskritt Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornation Cornatio	outcon PO ₅ 3 3 1 1 2 3 1 2 5 1 2 5 1 2 5 1 3 3 1 2 5 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 1 1 1 1 1 1 1 1 1 1 1 1	age, PO ₆ - D ₁₀ - Comment PO ₆ 2 2 2 ignifican Present Sanskri eering-F riting. h interna entation	The engin nunication program PO ₇ 3 2 nt; 3 – Str /Future T t Literatu Electrical al evaluat etc. and e	rong Pense, Si Post rong Pense, Si ure. , Mecha ion (30 external New De	society roject n nes PO ₉ 2 nical, <i>A</i> evalua	PO10 PO10 2 Sentence compri-	PO ₁₁ ent and f PO ₁₁ ess. eture, ising tw marks)	ent and finance, PO ₁₂ 2 2 2 2 2 2 0 c class which		
sustainability, 1 PO ₁₂ - Life-long Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Con Unit: 2 Unit: 2 Unit: 4 Unit: 4 Unit: 4 Examination sessional examinity end Text Books: 1 "Abhyas 2 "Teach Sanetha	PO ₈ - Ethics Learning PO ₁ 2 3 tents: 1 2 3 4 5 and Eval ms/ assig semester pustakan Yourself	Alpha PO ₂ Alpha Order Techi Math Litera <b>uation</b> ment exami	1 – Re bets in S c, Introd nical con ematics. ture of Pattern s/ quiz/ nation. Vishwa it" Prath	PO4 PO4 PO4 easonab Sanskrit luction Sanskrii : It inclu / semin s, Sams nama De tion	vork, P outcon PO₅ 3 3 3 1e; 2 - S t, Past/ of roots n about of Engin t and w ude bot ar prese krita-Bl eeksha-	age, PO ₆ - D ₁₀ - Comr nes with PO ₆ 2 2 ignificar Present/ Sanskri eering-F riting. h interna entation harti Pub	The engin munication program PO ₇ 3 2 at; 3 – Str /Future T t Literatu Electrical al evaluat etc. and c	ion (30 external New De shastri,	society roject n ees PO ₉ 2 2 mple S nical, <i>A</i> evalua	PO10 PO10 2 Sentence Architece tition (70	PO ₁₁ ent and f PO ₁₁ es. eture, ising tw marks) krit	ent and finance, PO ₁₂ 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		
sustainability, I PO ₁₂ - Life-long Course Outcomes CO ₁ CO ₂ CO ₃ CO ₄ Detailed Con Unit: 2 Unit: 2 Unit: 4 Unit: 4 Unit: 4 Examination sessional examis mainly end Text Books: 1 "Abhyas 2 "Teach Sanstha Reference Bo	PO ₈ - Ethics Learning PO ₁ 2 3 tents: 1 2 3 4 5 and Eval ms/ assig semester pustakan Yourself nam, New oks:	Alpha PO ₂ Alpha Order Techi Techi Mathi Litera <b>uation</b> gnment cexami n" – Dr. Sanskr v Delhi	1 – Ra bets in S r, Introd nical infa nical con ematics. ture of Pattern s/ quiz/ nation. Vishwa it" Prath Publica	PO4 PO4 easonab Sanskrit luction cormation cormation cormation Sanskrit : It inclu / semin s, Sams nama Do tion.	vork, P outcon PO₅ 3 3 3 <i>it</i> ; 2 – S <i>i</i> , Past/ of roots on about of Engin t and w ude bot ar prese krita-Bl eeksha-	age, PO ₆ - D ₁₀ - Comr nes with PO ₆ 2 2 ignificar Present/ Sanskri eering-F riting. h interna entation harti Pub	The engin munication program PO ₇ 3 2 at; 3 – Str /Future T t Literatu Electrical al evaluat etc. and c	ion (30 external New De shastri,	society roject n es PO ₉ 2 2 mple S marks) evalua	PO ₁₀ PO ₁₀ 2 Sentence Comprise Compr	PO ₁₁ es. es. eture, ising tw marks) krit	ent and finance, PO ₁₂ 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		

Course Code Cour						Гitle			Lec	ture			
PGCS1340	GET			Val	ue Edu	cation			L	T P	Sem	ester: I	
Version: 1.2			Date o	of Appro	oval: 16t	th BoS 17	-11-2022		4	0 0			
	Scheme	of Instr	uction				Sc	heme o	f Exam	ination			
No. of	Periods	: 60	Hrs.					Ma	ximum	Score	:	100	
Periods	/ Week	: 4						Intern	al Eval	uation	:	30	
	Credits	: 4				End Semester : 70							
Instructio	n Mode	: Le	cture .					Ex	am Du	iration	:	3 Hrs.	
Prerequisite(	s): No Spe	ecific pi	rerequis	site									
1 Understar	d value	of oduo	ation or	d colf	dovolor	mont							
1. Understan	In value	s in stud	duon ai	iu seii-	uevelo	Jillent							
2. Inibible go	hould kn	ow abo	ut the i	mnorta	nce of c	haracter	•						
4 To teach	and incul	cate the	essent	ial qual	lities to	hecome	a good le	ader					
Course Outcomes (CO):													
COs No.		<i>,</i> .		S	tateme	nt				Мар	ped Pr	ogram	
										Out	comes	(POs)	
CO ₁	Knowle	dge of s	self-dev	elopme	ent.					$PO_6$ , 1	PO ₇ , PO	<b>D</b> ₈ , <b>PO</b> ₉ ,	
										I	PO10, PO	<b>D</b> ₁₂	
CO ₂	Learn t	he impo	ortance	of Hum	an Valu	ies.				<b>PO3</b> ,	PO7, PO	<b>D</b> ₈ , <b>PO</b> ₉ ,	
										I	PO ₁₀ , PO	<b>D</b> ₁₂	
CO ₃	Develop	oing the	overall	persor	nality.					$PO_3$ , 1	$PO_6, PO_6$	<b>D</b> ₇ , <b>PO</b> ₈ ,	
								14.0		PO	9, <b>PO</b> 10,	<b>PO</b> ₁₂	
CO ₄	Gain de	eper ur	er understanding about the purpose of them life. <b>PO3, PO6, PO7, PO8,</b>									<b>D</b> ₇ , <b>PO</b> ₈ ,	
DO Engineer	ng Vnou	ladra 1	DO Da	oblom	nolucia	DO D	agion /dave	lonmont	t of a	PO	$\mathbf{PO}_{10}, \mathbf{PO}_{10}, PO$	PO ₁₂	
investigations of	ing Know	reage, <b>I</b> z probler	$PO_2 - PT$	Moder	marysis,	PO3-Do	The engine	eer and	t OI SC	<b>PO</b> F	PO ₄ -	Conduct	
sustainability. P	<b>O</b> s- Ethics	s <b>PO</b> o- Ir	ns, <b>rO</b> s ndividual	or team	work P	age, <b>FO</b> 6 <b>O</b> 10- Comi	munication	. <b>PO</b> 11- P	roject n	, <b>FO</b> 7 E nanagem	ent and	finance	
PO ₁₂ - Life-long	Learning	,	i ui vi u u u	or courr		010 00111		,	10,0001	anagen	erre arra	initarioo,	
		Мар	ping of	course	outcon	nes with	program	outcom	es				
Course	PO,	PO ₂	PO	PO	PO-	POc	PO-	PO	PO.	PO	DO4	PO	
Outcomes	101	102	103	104	105	100	107	108	109	1 010	IOI	1012	
CO ₁						3	2	2	3	3		2	
CO ₂			2				3	2	3	2		3	
CO ₃			3			3	3	3	2	3		2	
CO ₄			3			3	3	3	3	2		3	
D . 11 1 G			1 – Re	easonab	le; 2 – S	lignificat	nt; 3 – Str	ong					
Detailed Cont	tents:	17.1		10 1	1		1 1	1 · 1·	• 1 1		T 4 7 1	(1.)	
Linite 1		Values	s and se	elf-deve	lopmen	it -Socia	l values ai	nd indiv	idual a		S. Work	tethics,	
Unit: I		nrinci	nlog Va	luo iud	manisii	i. Morai	and non	- 11012	ii valu	ation. S	stanuar	us and	
		Impor	pies. va	f cultiv	ation of		Songo of	d	11417	Dovoti	on	Solf-	
Unit: 2	,	relian		nfiden		values.	tion Tri	u ithfulne	uly.	leanline	on, ee H	onesty	
01110. 2		Huma	nity Po	wer of	faith N	ational I	Jnity Patr	iotism	Love f	or natu	e Disc	ripline	
		Perso	nality a	nd Bet	avior T	)evelopn	nent - So	ul and	Scient	ific atti	tude	Positive	
		Think	ing. Int	egrity a	and dis	cipline.	Punctuali	tv. Love	e and	Kindnes	s. Avo	id fault	
Unit: 3	5	Think	ing. Fre	e from	anger, 1	Dignity o	of labor. U	Jniversa	l broth	nerhood	l and r	eligious	
		tolera	nce. Tr	ue frier	ndship.	Happine	ss Vs suff	ering, le	ove for	truth.	Aware	of self-	
		destru	ictive h	abits. A	ssociati	on and C	Cooperati	on. Doir	ng best	for sav	ing nat	ure.	
I Init.		Chara	cter an	d Com	petence	e -Holy	books vs	Blind f	faith. S	elf-mai	nageme	ent and	
	:	good	health.	Science	e of rein	carnatio	n. Equalit	y, Nonv	iolence	e, Humi	lity.		
I Init.		Role o	of Wom	en. All	religior	ns and sa	ame mess	age. M	lind yo	ur Mine	1, Self-	control	
		Hones	sty, Stu	dying et	ffective	ly.							
Examination	and Eval	uation l	Pattern	: It incl	ude bot	h interna	al evaluati	on (30 1	marks)	compri	sing tv	vo class	
sessional exar	ns/ assig	nments	s/ quiz/	∕ semin	ar prese	entation	etc. and e	external	evalua	tion (70	marks	s) which	
is mainly end	semester	· examir	nation.										
Text Books:													

1	Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University
	Press, New Delhi.
Refe	erence Books:

1 https://fdp-si.aicte-india.org/8dayUHV__download.php

Course Co	ode			С	ourse T	itle			Leo	ture		
PGCS231C	ЪЕТ			Const	itution	of India	1 I		L	T P	Seme	ster: II
Version: 1.2			Date o	f Appro	val: 16tl	h BoS 17-	-11-2022		4	0 0		
	Scheme o	of Instr	uction				S	cheme o	of Exai	ninatio	n	
No. of	Periods	: 60	Hrs.					Ma	ximum	Score	:	100
Periods	s/Week	: 4						Intern	al Eval	uation	:	30
	Credits	: 4						E	and Sea	mester	:	70
Instructio	on Mode	: Le	Lecture Exam Duration : 3 Hrs.									3 Hrs.
Prerequisite(s)	: No Spe	cific pi	rerequi	isite								
Course Object	ives:											
1. Understan	d the pr	emises	inform	ing the	twin t	hemes o	of libert	y and f	reedo	m from	a civil	rights
perspective	e.											
2. To address	the grow	rth of In	dian op	inion re	egarding	g moderi	n Indian	intellec	tuals' c	constitu	tional re	ole and
entitlemen	t to civil	and ecc	onomic	rights a	s well a	s the em	ergence	e of nati	onhoo	d in the	e early y	ears of
Indian nati	onalism.											
3. To address	the role	of socia	ilism in	India af	ter the	commen	ncemen	t of the l	Bolshe	vik.		
4. Revolution	in 1917 ai	nd its in	npact of	n the in	itial dra	fting of	the Indi	an Cons	titutio	n.		
Course Outcor	nes (CO):										1.5	
COs No.				St	atemer	nt				Мар	ped Pro	gram
	TT 1									Out	comes (	POs)
CO1	the bull	tand th k of Ind	e growt ians bef	th of the	e demai arrival	of Gand	vil right hi in Ind	is in Ind	ia for tics.	PC	<b>D</b> ₂ , <b>PO</b> ₆ , <b>I</b>	2012
CO ₂	Unders	tand th	e intelle	ectual o	rigins o	f the fra	mework	of argu	ment	PC	04, PO8, I	PO ₁₂
	that informed the conceptualization of social reforms leading to											
	revolut	revolution in India.										
CO ₃	Understand the circumstances surrounding the foundation of the								of the	$PO_1$ , $PO_3$ , $PO_6$ , $PO_7$ ,		
	Congress Socialist Party [CSP] under the leadership of Jawahark								harlal		PO ₈ , PO	12
	Nehru and the eventual failure of the proposal of direct election							tions				
	through	n adult s	suffrage	e in the	Indian (	Constitu	tion.	0				
	Unders	tand the	e passa	ge of th	e Hindu	Code B	ill of 195	6.	C		$D_1, PO_2, I$	
investigations of	ig Knowle	problem	D ₂ - Proi	Modern i	alysis, i	$PO_3 - Des$	Sign/dev The engi	elopineni veer and	societa	Diutions,	PO ₄ - C	ent and
sustainability. PC	<b>0</b> ₈ - Ethics.	PO9- Ind	lividual c	or team w	vork. <b>PO</b>	6- Comm	unicatio	n. <b>PO</b> 11- P	roiect n	nanagen	nent and i	finance.
PO12- Life-long L	earning				,			,	5	0		,
		Марр	ing of c	course o	outcome	es with p	rogram	outcom	es		_	_
Course	PO ₁	PO ₂	PO ₂	PO4	PO₅	POs	PO ₇	ΡO。	PO	PO ₁₀	PO ₁₁	PO ₁₂
Outcomes	101	102	103	104	105	100	10/	108	109	1010	101	1012
CO1			2			2						3
<b>CO</b> ₂				2				3				2
CO ₃	2		3			2	3	2				2
CO ₄	2	2	3	L				3				
			1 – Rea	isonable	:; 2 - Się	gnificant	t; 3 – Stı	rong				
Detailed Conte	ents:	r .										
		Histor	ry of M	faking o	of the l	ndian C	onstitut	tion: His	story 1	Drafting	g Com	mittee,
Unit: 1		(Com	position	n & W	(orking)	, Philoso	ophy of	the Inc	lian C	onstitut	tion: Pre	eamble
		Salien	t Featu	res.		1	0. D. I		1	. 1 . D.	1	1
		Conto	ours of	Consti	tutiona	I Rights	& Dut	ies: Fur	idame	ntal Rig	ghts, Ri	ght to
Unit: 2		Equal	ity, Rig	nt to F	reeaom	i, Right	against	Exploit	ation,	Right t	o Freed	IOM OF
		Direct	on, Cui	tural al	af Stata		Rights,	RIGHT L		stitutio	mai ken	neales,
		Organ		Gover	nanco	Darlian	anualli		ition	Oualif	iontions	and
		Disqu	15 UI alificati	ong E	Doworg	and I	Superior	Even	utivo	Quall	opt Cor	anu,
Unit: 3 Council of Ministers Judiciary Appointment and Transfer of Judges								udges				
		Oualifications. Powers and Functions										
		Local	Admin	istratio	n. Diet	rict's Ad	minietr	ation b	ad. D	ole and	d Impo	rtance
		Munie	rinalitie	s. Intro	duction	Mayor	and rol	e of Fler	rted P	enreger	tative (	CEO of
LInit• 4		Manie	sipal Ca	s. intro	D	, may01	and I Of			Zila Daa	harrat T	lacted
01111. 4		Mumic	Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected									

		Organizational Hierarchy (Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy.									
		Election Commission: Election Commission: Role and Functioning, Chief									
	Unit: E	Election Commissioner and Election Commissioner, State Election Commission:									
	Unit. 5	Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and									
		women.									
Exar	nination and Evalu	ation Pattern: It include both internal evaluation (30 marks) comprising two class									
sess	ional exams/ assign	ments/quiz/seminar presentation etc. and external evaluation (70 marks) which									
is m	ainly end semester	examination.									
Text	: Books:										
1	The Constitution	of India, 1950 (Bare Act), Government Publication.									
2	Dr. S. N. Busi, Dr.	B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.									
Refe	erence Books:										
1	M. P. Jain, Indian	Constitution Law, 7th Edn., Lexis Nexis, 2014.									
2	D.D. Basu, Introd	luction to the Constitution of India, Lexis Nexis, 2015.									

Course Coo	de			С	ourse T	itle			Leo	ecture				
PGCS232G	ET			Peda	agogy S	tudies			L	Т Р	Seme	ster: II		
Version: 1.2			Date o	f Appro	val: 16tl	h BoS 17-	-11-2022		4	0 0				
S	cheme o	of Instru	uction				S	cheme o	of Exai	ninatio	n			
No. of I	Periods	: 60	Hrs.					Ma	ximum	Score	:	100		
Periods	Week	: 4						Intern	al Eva	uation	:	30		
(	Credits	: 4				End Semester : 70								
Instruction Dronoguigito(g):	n Mode	: Lee	cture	igito				ΕΣ	am Di	iration	:	3 Hrs.		
Course Objectiv	No spe	enie pi	erequ	isite										
1 To Acquire	znowled	ge of pe	edagogi	ical the	ories of	relevanc	e to wo	rk with	neonle					
2. To understa	ind the h	asic vie	w of di	fferent	pedago	gical ori	entation	IK WICH	реори	•				
3. To demonst	rate con	cepts re	elated t	o comm	unicati	on theor	v - desc	ribe and	lreflec	t on diff	erent tl	neories		
of motivatio	n and le	arning.					<i>J</i>							
4. To Illustrate	e the cri	tical evi	idence	gaps to	guide t	he deve	lopmen	t and ac	count	for diffe	erent fo	rms of		
supervision					-		-							
Course Outcom	es (CO):													
COs No.				St	tatemer	nt				Map	ped Pro	gram		
										Out	comes (	POs)		
CO ₁	Unders	tand th	e pedag	gogical	practice	es used b	by teach	ers in fo	ormal	PC	$P_1, PO_2, I$	PO₃		
	and info	ormal cl	assroo	ms in de	evelopin	ig count	ries							
CO ₂	Analyze	the ev	vidence	on the	effecti	veness o	of these	e pedago	ogical	PC	3, <b>PO</b> 4,	PO ₆		
	practices in what conditions, and with what													
CO	Appluzo	Sopulation of reachers:										DO.		
$CO_3$	The sc	hool c	urricult	ition (Ci im and	midan mida	nce mat	erials	n) anu	nnort	PU	7, PO ₈ ,	PU9		
	effectiv	e nedao	anneun aagy?	ini anu	guiuai			Jest su	pport					
CO4	Evaluat	e differ	ent form	ns of Si	pervisi	าท				PO ₂	POs PO	9. PO12		
<b>PO</b> ₁ - Engineering	$PO_1$ - Engineering Knowledge, $PO_2$ - Problem analysis, $PO_3$ - Design/development of solutions, $PO_4$ - Conduct													
investigations of a	complex j	problem	s, <b>PO</b> 5- 1	Modern	tool usag	ge, <b>PO</b> 6- 7	The engi	neer and	society	, <b>РО</b> 7- Е	nvironm	ent and		
sustainability, <b>PO</b>	- Ethics,	PO9- Ind	ividual o	or team v	vork, <b>PO</b> 1	10- Comm	unicatio	n, <b>PO</b> 11- P	roject n	nanagem	ent and	finance,		
PO ₁₂ - Life-long Le	arning	Mapp	ing of a	ourso c	utcom	o with p	rogram	outcom	00					
Course		wapp				s with p	logram	outcom						
Outcomes	PO ₁	$PO_2$	PO ₃	PO ₄	PO ₅	PO ₆	<b>PO</b> ₇	PO ₈	PO ₉	<b>PO</b> ₁₀	<b>PO</b> 11	<b>PO</b> ₁₂		
CO ₁	2	1	2											
CO ₂			1	2		2								
CO ₃							2	2	2					
CO ₄		2						2	2			2		
			1 - Rea	isonable	; 2 – Sig	nificant	; 3 – Sti	rong		•	•			
Detailed Conter	nts:													
		Introd	luction	and M	ethodol	ogy: Ain	ns and	ratio	nale,	Policy	backg	round,		
Unit [.] 1		Conce	eptual	framew	ork an	d termir	nology⊡	Theorie	es of	learnin	g, Curri	culum,		
01110.1		Teach	er edu	ication.	Conce	eptual f	ramewo	ork, Rese	earch c	uestion	s. Over	view of		
		metho	odology	and se	arching					•		0 1		
		Them	atic ove	erview:	Pedago	gical pra	ctices a	re being	g used	by teac	hers in	formal		
Unit: 2		and	informa	al class	srooms	in dev	eloping	count	ries.	Curricu	lum, T	eacher		
		Euidor		the offe	ativono	ag of por	lagagia	lprooti	oog M	thodal	ortor	the in		
		denth	stade	uie elle quality	assessm	ss or peo	agugica	a pracu studiec	HOW	cuiouoli can teoc	ber edi	ucation		
		(curriculum and practicum) and the school curriculum and guidence materials												
Unit: 3		best support effective pedagooy? Theory of change Strength and pature of the												
		body of evidence for effective pedagogical practices. Pedagogic theory and												
		pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic												
		strate	strategies.											
тт •,      4		Profes	ssional	develor	oment:	alignmei	nt with	classroo	om pra	octices	and fol	ow-up		
Unit: 4		suppo	rt, Peer	r Suppo	rt from	the head	d teache	er and th	ie com	munity.		1		

		Curriculum and assessment Barriers to learning: limited resources and large class sizes.							
	Research gaps and future directions ^{DD} Research design. Contexts Pedag								
	Unit: 5	Teacher education. Curriculum and assessment ^{III} Dissemination and research							
		impact.							
Exar	nination and Evalua	ation Pattern: It include both internal evaluation (30 marks) comprising two class							
sess	ional exams/ assign	ments/quiz/seminar presentation etc. and external evaluation (70 marks) which							
is ma	ainly end semester e	examination.							
Text	Text Books:								
1	Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-								
	261.								
2	Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum								
	Studies, 36 (3):361-	-379.							
Refe	Reference Books:								
1	Akyeampong K (2	003) Teacher training in Ghana - does it count? Multi-site teacher education							
	research project (MUSTER) country report 1. London: DFID.								
2	Akyeampong K, Lu	ssier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths							
	and reading in A	Africa: Does teacher preparation count? International Journal Educational							
	Development, 33 (3	3):272–282.							

Course Code		Course Title							Lee	cture			
PGCS233GET		Stress Management by Yoga							L	Т Р	Semester: II		
Version: 1.2		Date of Approval: 16th BoS 17-11-2022					4	0 0					
	Scheme o	f Instruction Scheme of Exam						minatio	n				
No. of	Periods	: 6	0 Hrs.			Maximum Score						100	
Periods	/ Week	: 4				Internal Evaluation : 3						30	
	Credits	: 4				End Semester :					70		
Instructio	n Mode	: L	ecture					Ex	kam Di	uration	:	3 Hrs.	
Prerequisite(s)	: No Spe	cific ]	prerequ	isite									
Course Objecti	ves:												
1. To achieve	overall h	ealth	of body a	nd min	d.								
2. To overcon	ne stress.												
3. To learn di	ferent as	ans.											
4. To organize	e yoga wo	orksho	ps										
Course Outcon	nes (CO):			~						3.5			
COs No.				St	tatemen	it				Mapped Program Outcomes (POs)			
CO ₁	Unders social h	tand t ealth.	ne health	ny mind	in a hea	althy boo	dy thus i	improvi	ng	PO	<b>D</b> ₆ , <b>PO</b> ₇ ,	PO ₈	
CO ₂	Unders	tand t	ne Impro	oved effi	iciency v	with diff	erent as	sans.		PO ₆ , PO ₇ , PO ₈ , PO12			
CO ₃	Unders	tand t	ne Impro	vement	t in brea	thing w	ith asan	s.		PO	PO ₆ , PO ₇ , PO ₉		
CO ₄	Apply a	nd Pra	ctice Pra	ayanam	a and as	ans.				PO ₆ , PO ₇ , PO ₈ , PO ₁₂			
investigations of sustainability, <b>PO</b> <b>PO</b> ₁₂ - Life-long L	complex _I 8- Ethics, I earning	orobleı <b>PO</b> 9- II	ns, <b>PO₅</b> -∃ dividual o	Modern or team v	tool usag vork, <b>PO</b> 1	ge, <b>PO</b> 6- 7 0- Comm	The engiı unicatioı	neer and n, <b>PO</b> 11- P	society roject r	7, <b>PO</b> 7- I nanagen	nvironm nent and	ient and finance,	
		Map	ping of c	course c	outcome	es with p	rogram	outcom	nes				
Course	PO ₁	PO ₂	PO₃	PO₄	PO ₅	POs	PO ₇	POs	PO	<b>PO</b> 10	PO ₁₁	<b>PO</b> 12	
Outcomes	101	102	103	101	103	100	107	108	103	1 0 10	101	1 0 12	
						3	2	2					
						2	3	2			-	2	
CO ₃						3	3	0	2			0	
CO ₄			1 D.			2	3	3				3	
Detailed Conta	nta		1 – Red	isonabie	e; 2 – Sig	Inifican	t; 3 – Sti	rong					
Unit 1	nts.	Defi	nitions o	f Fight i	parts of	vog ( As	shtanga)						
		Yam and Nivam Do's and Don't's in life Ahinsa satva astheva hrambacharva											
Unit: 2		and aparigraha.											
Unit: 3		Shaucha, santosh, tapa, swadhyay,ishwar pranidhan											
Unit: 4		Asan and Pranayam, Various yog poses and their benefits for mind &body.											
Unit: 5	Unit: 5 Regularization of breathing techniques and its effects-Types of pranavama							na.					
Examination a	nd Evalua	ation	Pattern:	It inclu	de both	internal	evaluat	ion (30	marks	) compr	ising tw	vo class	
sessional exams/assignments/quiz/seminar presentation etc. and external evaluation (70 marks) which													
is mainly end semester examination.													
Text Books:													
¹ Yogic Asanas for Group Tarining-Part-I":Janardan Swami Yogabhyasi Mandal,													
Nagpur.													
Keterence Bool	KS:	·		Trade	-1 NT-4		<b>C</b>	1 17. 1	¹	n 4.1		alawa	
(Publication Department), Kolkata.													

Course Co	Course Title Lec							ture					
PGCS234G	Personality Development Through Life Enlightenment Skills						L	Т Р	P Semester: II				
Version: 1.2	<b>Date of Approval:</b> 16th BoS 17-11-2022 4					4	0 0						
5	Scheme o	f Instruction Scheme of Exa						of Exar	mination				
No. of	: 60 Hrs. Max				ximum	Score	:	100					
Periods	/ Week	: 4						Intern	al Eval	uation	:	30	
	Credits	: 4						I	End Semester : 70			70	
Instructio	n Mode	: Le	cture	,				Ex	kam Di	iration	:	3 Hrs.	
Prerequisite(s)	No Spe	спіс рі	rerequ	Isite									
1 To loarn to	ves:	ho high	ost do	lhanni	1.7								
2 To become	a nerson	with st	table m	ind ple	iy. asing ne	ersonalit	v and d	etermin	ation				
3. To awaken	wisdom i	in stude	ents.	ina, pie	asing pe	.i sonane	y and u						
4. To learn ho	w to live	a pure	life.										
Course Outcon	nes (CO):	F											
COs No.				St	tatemen	ıt				Мар	ped Pro	gram	
										Out	comes (	POs)	
CO ₁	Unders	tand th	e Study	of Shri	mad-Bh	agwad-	Geeta a	nd devel	lop	PO	<b>1, PO</b> ₂ , 1	PO₃	
	persona	ality to a	achieve	the hig	hest go	al in life							
$CO_2$	Apply th	ne knov	vledge	of Geeta	a to lead	l the nat	ion and	mankin	d to	PO ₁ , PO ₃ , PO ₄ , PO ₁₂			
	peace												
	and pro	sperity			1	11		- 4 1 -					
$CO_3$	Apply th	ie Study of Neetishatakam in developing versatile									$PO_3, PO_4, PO=, PO_{12}$		
	student												
CO4	Create	.s. the ahil	ity to li	ve hette	r way o	f life				PO ₁ I	PO2 PO	$\mathbf{D}_{\mathbf{a}} \mathbf{P}_{\mathbf{a}} \mathbf{P}_{\mathbf{a}} \mathbf{P}_{\mathbf{a}}$	
004	ereute	une ubn			i way o	r me				PO6, PO7, PO12			
PO1- Engineerin	g Knowle	edge, PC	D ₂ - Pro	blem an	alysis, <b>F</b>	PO3- Des	sign/dev	elopmen	t of so	olutions,	<b>PO</b> ₄ - (	Conduct	
investigations of	complex p	problem	s, <b>PO</b> 5-	Modern	tool usag	ge, <b>PO</b> 6- [	The engi	neer and	society	, <b>РО</b> 7- Еі	nvironm	ent and	
sustainability, <b>PO</b>	8- Ethics, I	PO9- Ind	lividual o	or team v	vork, <b>PO</b> 1	0- Comm	unicatio	n, <b>PO</b> 11- P	roject n	nanagem	entand	finance,	
PO12- LITE-IONS L	carning	Mapp	ing of a	ourse o	nutcome	es with n	rogram	outcom	nes				
Course													
Outcomes	PO ₁	$PO_2$	PO ₃	$PO_4$	PO ₅	$PO_6$	<b>PO</b> ₇	PO ₈	PO ₉	<b>PO</b> ₁₀	<b>PO</b> ₁₁	<b>PO</b> ₁₂	
CO ₁	3	2	2										
<b>CO</b> ₂	2		3	3								2	
CO ₃			3	1			2					2	
CO ₄	2	2	3	3		2	3					2	
			1 – Rea	isonable	e; 2 – Sig	gnificant	t; 3 – Sti	rong					
Detailed Conte	nts:		. 1		· · · · ·			6		1.		-	
Linite 1		Neeti	satal	(am-	Holistic	devel	lopment	t Of	per	sonality	ς, Ν απο) Ι	/erses-	
Unit: I		19,20,	21,22(W) 63 65(v)	istuo) J	Ver	Ses- 52 53 50	29,31,3 (dont's)	02 (j Verses	2010e - 71 73 '	&nerois 75 78(do	SIII), V Ve)	erses-	
		Δpprc	$\frac{03,03(v)}{2}$	dav-to-	-day wo	<u>52,55,55</u> rk and d	luties 9	hrimad	Bhaow	73,78(u0 73d Gee	ta: Cha	nter 2-	
Unit: 2 Unit: 2 Verses 41 47 48 Chapter 3- Verses 13 21 27 35													
Chapter 6-Verses 5.13.17, 23.35, Chapter 18-Verses 45, 46.48, Statements								ents of					
Unit: 3	Unit: 3 basic knowledge., Shrimad Bhagwad Geeta: Chapter 2-Verses 56, 62.68												
Chapter 12 - Verses 13, 14, 15, 16, 17, 18, Personality of Role model. Shrimad							imad Bh	agwad					
Geeta:													
Unit: 5 Chapter2-Verses 17, Chapter 3-Verses36,37,42, Chapter 4-Verses 18,38,39, Chapter18 – Verses37.38.63													
<b>Examination and Evaluation Pattern:</b> It include both internal evaluation (30 marks) comprising two class													
sessional exame	s/ assign	ments/	′ quiz/	semina	r presen	ntation e	tc. and	external	evalua	tion (70	marks)	which	
is mainly end se	emester e	examina	ation.										
Text Books:											<i>(</i> -		
1 Srimad	Bhagav	ad G	ita"	by S	wami	Swaru	panand	a Adv	vaita	Ashrai	m(Publi	ication	
Departme	ent),Kolk	ata.											
Reference Books:													

1	Bhartrihari's	Three	Satakam	(Niti-sringar-vairagya)	by	P.Gopinath,	Rashtriya	Sanskrit
	Sansthanam,	New De	elhi.					