

Puducherry

(As per UGC - 2018 Regulations and Affiliated to Pondicherry University)

### PUDUCHERRY - 605107

### DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

M.TECH.

### ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

(REGULATIONS - 2023)

**CURRICULUM AND SYLLABI** 

5.151-

### **COLLEGE VISION AND MISSION**

### VISION

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society.

MISSION	
M1: Quality Education	: To provide comprehensive academic system that amalgamates the cutting edge technologies with best practices.
M2: Research and Innovation	: To foster value-based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.
M3: Employability and	
Entrepreneurship	: To inculcate the employability and entrepreneurial skills through value and skill based training.
M4: Ethical Values	: To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society.

#### DEPARTMENT VISION AND MISSION

### VISION

To create a productive learning and research environment for graduates to become highly dynamic, competent, ethically responsible, professionally knowledgeable in the field of computer science and engineering to meet the industrial needs on par with global standards.

#### MISSION

**M1: Quality Education:** Empowering the students with the necessary technical skills through quality education to grow professionally.

**M2: Innovative Research:** Advocating the innovative research ideas by incorporating with industries for developing products and services.

**M3:** Placement and Entrepreneurship: Advancing the education by strengthening the Industryacademic relationship through hands-on training to seek placement in the top most industries or to develop a start-ups.

**M4: Ethics and Social Responsibilities:** Stimulating professional behaviour and good ethical values to improve the leadership skills and social responsibilities.

5. ASL-

#### **PROGRAMME OUTCOMES (POs)**

**PO1:** Exploration of Research: An ability to independently carry out research/investigation and development work to solve practical problems.

**PO2:** Technical Skill: An ability to write and present a substantial technical report/document.

**PO3:** Expertise in Academics: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

**PO4:** Scholarship of Knowledge: Acquire in-depth knowledge of specific discipline or professional area, including wider and global perspective, with an ability to discriminate, evaluate, analyze and synthesize existing and new knowledge, and integration of the same for enhancement of knowledge.

**PO5:** Usage of Modern Tools: Create, select, learn and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities with an understanding of the limitations.

**PO6:** Ethical Practices and Social Responsibility: Acquire professional and intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainable development of society.

### **PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

**PEO1: Competitive Platform:** To create a competitive platform for solving critical problems in a wide variety of fields.

**PEO2: Exploration:** Enthusiastic participation in learning, understanding, designing and applying new innovative research ideas as the field evolves.

**PEO3: Career:** Applying cutting-edge technology that improves knowledge and to commit students for life-long learning to reach the leading positions in the career.

**PEO4: Professional Values:** Simulate the graduates to hold the responsibilities in the context of technology, ethics, society and humanity.

### **PROGRAM SPECIFIC OUTCOMES (PSOs)**

**PSO1: Computational Skills:** Graduates with the ability to apply basic knowledge of Computer Science in solving the critical problems.

**PSO2: Studious Research:** Ability to convert innovative ideas into research or society oriented projects through current trending technologies.

**PSO3: Employability:** Acquire placement in highly reputed industries or accomplish new technical business skills with the contemporary trends in the industry.

SI.No	Course Category	Breakdown of Credits
1	Humanities and Social Sciences (HS)	-
2	Basic Sciences(BS)	3
3	Engineering Sciences (ES)	-
4	Professional Core (PC)	31
5	Professional Electives (PE)	18
6	Open Electives (OE)	-
7	Project Work and Internship	20
8	Ability Enhancement Courses (EEC)	-
9	Mandatory courses (MC)	-
	Total	72

# STRUCTURE FOR POSTGRADUATE ENGINEERING PROGRAM

SLNo	Course Category		Credi Sem	Total		
0	Course Calegory	I	II	III	IV	Credits
1	Humanities and Social Sciences (HS)	-	-	-	-	-
2	Basic Sciences(BS)	3	-	-	-	3
3	Engineering Sciences (ES)	-	-	-	-	-
4	Professional Core (PC)	15	16	-	-	31
5	Professional Electives (PE)	3	6	9	-	18
6	Open Electives (OE)	-	-	-	-	-
7	Project Work and Internship			8	12	20
8	Ability Enhancement Courses (AEC)*	-	-	-	-	-
9	Mandatory Courses (MC)*	-	-	-	-	-
	Total	21	22	17	12	72

\* AEC, MC Credits are not included for CGPA calculation

5. ASL-

		SEN	MESTER – I							
SI.	Course	Course Title	Catagory	Pe	erio	ds	Cradita	M	ax. Mar	ks
No.	Code	Course Title	Calegory	L	Τ	Ρ	Credits	CAM	ESM	Total
Theo	pry									
1	P23BST103	Probability and Statistics	BS	2	1	0	3	40	60	100
2	P23ADT101	Machine Learning Algorithms	PC	3	0	0	3	40	60	100
3	P23ADT102	Computing System for Data Science	PC	3	0	0	3	40	60	100
4	P23ADT103	Artificial Intelligence & Intelligent Systems	PC	3	0	0	3	40	60	100
5	P23ADT101	Research Methodology and IPR	PC	2	0	0	2	40	60	100
6	P23ADE1XX	Professional Elective – I *	PE	3	0	0	3	40	60	100
Prac	tical									
7	P23ADP101	Machine Learning Algorithms Laboratory	PC	0	0	4	2	50	50	100
8	P23CCP101	Technical Report Writing and Seminar	PC	0	0	4	2	100	-	100
Audi	it Course									
9	P23ACT10X	Audit Course-I**	AC	0	0	2	-	100	-	100
Abili	ty Enhancemer	nt Course								
10	P23ADC1XX	Ability Enhancement Course-I #	AEC	0	0	4	-	100	-	100
							21	590	410	1000

# CURRICULUM

	SEMESTER – II												
SI.	Course	Course Title	Catagony	Pe	erio	ds	Cradita	Ma	ax. Mar	ˈks			
No.	Code	Course Inte	Category	L	Τ	Ρ	Credits	CAM	ESM	Total			
Theo	ory												
1	P23ADT204	IoT and Edge Computing	PC	3	0	0	3	40	60	100			
2	P23ADT205	Natural Language Processing	PC	3	0	0	3	40	60	100			
3	P23ADT206	Advanced Deep Learning	PC	3	0	0	3	40	60	100			
4	P23ADT207	AI and RPA	PC	3	0	0	3	40	60	100			
5	P23ADE2XX	Professional Elective - II	PE	3	0	0	3	40	60	100			
6	P23ADE2XX	Professional Elective - III	PE	3	0	0	3	40	60	100			
Prac	tical						•	•		•			
7	P23ADP202	Advanced Deep Learning Laboratory	PC	0	0	4	2	50	50	100			
8	P23CCP202	Seminar on ICT a hands-on approach	PC	0	0	4	2	100	-	100			
Aud	it Course		•										
9	P20ACT20X	Audit Course-II**	AC	0	0	2	-	100	-	100			
Abili	ty Enhanceme	nt Course											
10	P20ADC2XX	Ability Enhancement Course-II #	AEC	0	0	4	-	100	-	100			
							22	590	410	1000			

		SEMI	ESTER – III							
SI.	Course	Course Title	Category	Perio		ds	Crodite	Ma	ax. Mar	ks
No.	Code	Course Thie	Calegory	L	Г	Ρ	Creaits	CAM	ESM	Total
Theo	ory									
1	P23ADE3XX	Professional Elective – IV *	PE	3	0	0	3	40	60	100
2	P23ADE3XX	Professional Elective – V *	PE	3	0	0	3	40	60	100
3	P23ADE3XX	Professional Elective – VI *	PE	3	0	0	3	40	60	100
Prac	tical		•							
7	P23ADW301	Project Phase - I	PW	0	0	12	6	50	50	100
8	P23ADW302	Internship	PW	0	0	0	2	100	-	100
Abili	ty Enhanceme	nt Course								
10	P23ADC3XX	NPTEL/GIAN/MOOC	AEC	0	0	0	-	100	-	100
							17	370	230	600

	SEMESTER – IV												
SI.	Course	Course Title	Category	Periods			Crodite	Max. Marks					
No.	Code	Course Inte	Category	L	Н	Ρ	Credits	CAM	ESM	Total			
Prac	Practical												
7	P23ADW403	Project Phase - II	PW	0	0	24	12	50	50	100			
	12 50 50 100												

\* Professional Elective Courses are to be selected from the list given in Annexure I # Ability Enhancement Courses are to be selected from the list given in Annexure II \*\* Audit Courses are to be selected from the list given in Annexure III

- **BS-** Basic Science
- PC Professional Core
- PE Professional Elective
- PW- Project Work
- CC- Common Course
- AC- Audit Course
- AEC Employability Enhancement Course

5-15/--

### **CREDIT DISTRIBUTION**

Semester	I	Ш	III	IV	Total
Credits	21	22	17	12	72

Total number of credits required to complete M.Tech in Computer Science and Engineering : 72 credits

Department	Mathe	matics	Program	Programme : M.Tech.							
Semester	I		Course	Catego	ory: <b>BS</b>		*End Ser	neste	erExamTy	/pe: <b>TE</b>	
Course Code	P23M	AT105	Perio	ods/We	ek	Crea	lit	Max	timumMai	rks	
	1 251017		L	T	P	C	CA	М	ESE	TM	
Course Name	PROB	ABILITY AND STATISTICS	2	1	-	3	25	5	75	100	
	T	(AI&DS)									
Prerequisite	Basic	Mathematics									
	On c	ompletion of the course, the stud	lents will b	e able	to				BT Ma	apping	
	CO1	Apply the concept of probability in	random va	riables					(Fignes	(3	
	CO2	Apply the basic rules of continuous	s random v	ariables	3				K3		
	CO2	Apply the sensent of testing of hyp			ond lore		o in rool li	ifa	K)		
Course	003	Apply the concept of testing of hyp		Small a	anu larg	je sample	Sinteari	ne	r	~	
CO4 Concept of linear regression, correlation, and its applications										3	
	<b>CO5</b> List the quidelines for designing experiments and recognize the key historical										
	figures in Design of Experiments.										
UNIT – I	UNIT – I DISCRETE RANDOM VARIABLES Periods:12										
Random Variable Binomial and Pois	s and the	eir event spaces – The probability mass	function – D	istributio	on functi	ons – Bino	mial – Geo	metri	c – Negativ	′e CO1	
UNIT – II	CON	TINUOUS RANDOM VARIABLES				Period	s:12				
Some important of	distributi	ons - Exponential distribution -Gamma	a – Weibull	– Gaus	sian dis	tributions.	Application	n of d	listribution	– CO2	
Reliability – Failu	re densi	ty and Hazard function.									
UNIT – III	TEST	ING OF HYPOTHESIS				Period	s:12			<b>.</b>	
Sampling distribut	tions – S	Small and large samples –Tests based o	on Normal, t	test, Chi	i square	test, and F	test distri	outior	ns for testir	ng CO3	
or means, variance	e and p	roportions — Contingency table (test to	or independe	ni) Goo	uness c	n III.				COS	
	··										
UNIT – IV	COR	RELATION AND REGRESSION				Period	s:12				
UNIT – IV Correlation –Ran	COR k correl	RELATION AND REGRESSION ation– Regression –Multiple and partia	al correlation	– Metł	nod of l	Period east squar	<b>s:12</b> es – Plane	e of r	egression	- CO4	
UNIT – IV Correlation –Ran Coefficient of mul	COR k correl tiple cor	<b>RELATION AND REGRESSION</b> ation– Regression –Multiple and partia relation – Coefficient of partial correlation	al correlation on.	– Metł	nod of I	Period east squar	<b>s:12</b> es – Plane	e of r	egression	- CO4	
UNIT – IV Correlation –Ran Coefficient of mul	COR k correl tiple cor	RELATION AND REGRESSION ation– Regression –Multiple and partia relation – Coefficient of partial correlation	al correlation on.	– Meth	nod of I	Period east squar Period	s:12 es – Plane s:12	e of r	egression	- CO4	
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UNIT – IV Correlation –Ran Coefficient of mul UNIT – V Analysis of variar square design - 2	COR k correlative tiple cor DESI nce – Or <sup>22</sup> Factor	RELATION AND REGRESSION ation- Regression -Multiple and partia relation - Coefficient of partial correlation GN OF EXPERIMENTS ne way and two-way classifications - C ial design.	al correlation on. completely ra	– Metł	nod of l ed desi	Period east squar Period gn – Rando	s:12 es – Plane s:12 omized blo	e of r ock de	egression esign – Lat	- CO4	
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5. ASL-

# COs/POs/PSOs Mapping

COs		Progra	m Out	Program Specific Outcomes (PSOs)					
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	1	-	-	-	1	1	2	1
2	3	2	1	1	-	1	2	2	1
3	3	2	1	1	-	1	2	2	1
4	3	2	1	1	-	-	2	2	1
5	3	2	1	1	-	-	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ious Asse	(CAM)	End Semester	Total	
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Examination (ESE) Marks	Marks
Marks	1	0	15	10	5	60	100

Department	Artificial Intelligence and Data Science	Programme : M.Tech.												
Semester	I	Course Category: PC *Er												
Course Code		Max	timumMar	ks										
Course Code	P23ADT101	L	Т	Р	С	CAM	ESE	TM						
Course Name	Machine Learning Algorithms	3	-	-	3	40	60	100						
	(AI&DS)													
Prerequisite	NIL		i			i								
·	On completion of the course, the stude	nts will b	e able	to			BT Ma	pping						
							(Highes	t Level)						
Course Outcome	regression models	e learning	algorit	hms and	acquire kno	owledge of	<b>ה א</b> נ	2						
	<b>CO2</b> Explore the classification models an	d analyze	the clu	ustering	algorithms		K	3						
	CO3 Demonstrate the dimensionality redu	uction tech	nniques	S			K	3						
	CO4 Explore of Decision learning algorith	m and rul	e-base	d learnii	ng		K	3						
	CO5 Acquire knowledge on ensemble learning													
UNIT – I	Introduction to Machine Learning				Periods:9									
Basics of Machine	e Learning - Types of Machine Learning Algorithr	ms - Data F	Preproce	essing - I	ntroduction of	Regressio	n Algorithm	s						
<ul> <li>Linear Regress</li> </ul>	ion – Multivariate Linear Regression – Logistic Re	egression.						CO1						
UNIT – II	Classification and Clustering Models				Periods:9									
Basics of Classific Neighbor – Basic	cation Algorithms – Support Vector Machine – Na s of Clustering Algorithms - K-Means clustering -	ive Bayes K-Medians	– classi – Hiera	fying with archical C	conditional p Clustering – A	robabilities oplications.	– K-Neares	st CO2						
UNIT – III	Dimensionality Reduction Techniques				Periods:9									
Introduction- Subset Selection - Principal Component Analysis (PCA) - Factor analysis - Multidimensional Scaling - Discriminant Analysis (LDA) Case Study.														
UNIT – IV	Decision Trees and Rule Based Learnin	ng			Periods:9									
Decision tree rep with Apriori and F	resentation – ID3 – CART – Hidden Morkov Mo	del - Assoc	ciation r	ule minin	g – Associati	on rules - C	case studie	s <b>CO4</b>						
UNIT – V	Ensemble Learning				Periods:9									
Introduction – Bag	gging: Random Forest – Boosting: Adaboost and	XGBoost A	Algorithr	ms Light	GBM – Stack	ng.		CO5						
LecturePeriod	ds:45 TutorialPeriods:0	Practica	alPerio	ods:-0	Т	otalPerio	ls:45							
Text Books		1.1.40.00												
1. Henrik I	Brink, Joseph W. Richards, and Mark Fether	olf, "Real-	World	Machine	Learning", I	Manning P	ublications	s, 2017.						
2. Tom M.	Mitchell, "Machine Learning", McGraw-Hill S	Science, 1	997.			Ŭ								
3. Timothy	Howard Jackson "Al and Machine Learning	g for Code	rs: A P	rogramr	ner's Guide	to Artificial	Intelligen	ce",						
4. Peter H	arrington, "Machine Learning in action". Mar	nnina Pub	lication	2012										
Reference Boo	ks			, _ • · _ ·										
1. Charu (	C. Aggarwal, "Data Classification Algorithm	ms and A	pplicati	ions", C	hapman &	Hall/CRC	Data Mini	ing and						
2. Andreas	s C. Mueller and Sarah Guido, "Introductio	on to Mac	hine Le	earning	with Python	", O'Reilly	Media, Ir	nc. First						
Edition,	2016. Natt. Pozo Borbani, and Aggolos K. Kateag	aolos "M	achina	Loarnin	a Pofinod E	oundation	Algorithr	me and						
Applicat	tions", Cambridge University Press, 2016.	igelos, ivi	acrime	Leannin	y Neimeu F	Junuations	s, Aigonini	ns, anu						
4. Shai Sh Cambrid	alev-Shwartz and Shai Ben-David, "Underst	tanding M	achine	Learnin	g: From The	ory to Algo	orithms",							
5. Mehrya Edition	r Mohri, Afshin Rostamizadeh, Ameet Talwa 2012	ılkar, "Fou	ndatior	ns of Ma	chine Learn	ing", MIT F	Press, Sec	ond						
L														

5. ASL-

Web Re	efer	ences
	1.	https://www.coursera.org/learn/machine-learning
	2.	https://ml-cheatsheet.readthedocs.io/en/latest/regression_algos.html
	3.	https://machinelearningmastery.com/a-tour-of-machine-learning-algorithms/
	4.	https://www.coursera.org/learn/machine-learning.
	5.	https://www.youtube.com/watch?v=GwIo3gDZCVQ

# COs/POs/PSOs Mapping

COs		Progra	m Out	Program Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	2	1	2	2	3	2	2
2	1	2	2	2	2	2	3	2	2
3	2	3	3	1	3	3	3	3	3
4	2	3	3	1	3	3	3	3	3
5	2 3 3 1 3		3	3	3	3	3		

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ous Asse	essment Marks	(CAM)	End Semester	Total
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Examination (ESE) Marks	Marks
Marks	10		15	10	5	60	100

Department	Artificial Intelligence and Data Science Programme: M.Tech.											
Semester	I		Course	Catego	ory: <b>PC</b>	*En	d Semester	Exam Typ	e: <b>TE</b>			
Course Code	P234DT102		Perio	ds / We	eek	Credit	Max	imum Marl	٢S			
Course Coue	FZSADTIUZ		L	Т	Р	С	CAM	ESE	TM			
Course Name	Computing S	Systems for Data Science	3	-	-	3	40	60	100			
	<u>i</u>											
Prerequisite	Computer Orga	anization and Architecture/Op	perating S	ystem/l	Databas	se Manager	nent Systen	าร				
•	On completion	on of the course, the stude	nts will b	e able t	to			BT Ma	apping			
	_							(Highes	t Level)			
Course Outcomes	CO1 Unde const	rstand the issues related to th raints and to learn the feature	ne design es of Real	and an time O	alysis o S	f systems v	vith real-time	e K	K3			
	CO2 Classify and Compare various Uniprocessor and Multiprocessor scheduling mechanisms											
	CO3 Categ	porize the difference between	traditiona	al and re	eal time	databases	•	K	2			
	CO4 Acqui	ire knowledge about Data Sto	brage and	Manag	ement	Technologie	es	ĸ	3			
	CO5 Perce	eive information about St	torage A	rea N	Vetwork	s characte	eristics and	d K	3			
	compo	onents.				Dariada	<b>n</b>					
UNIT-I	time computing	Concepts: Example of real time	application	oc Stri	ucture of	Perioas:	y vetom Char	actorization	[			
of real time systems Time : Source code Systems	s and tasks - Har e analysis, Micro	d and Soft timing constraints - De barchitecture level analysis, Cach	esign Chall he and pip	enges - eline iss	Performation Provide Stresson Pro-	ance metrics	- Prediction c anguages for	of Execution Real-Time	CO1			
UNIT-II	Real-time OS	8				Periods:	9					
Real time OS – Th	hreads and Task	ks - Structure of Microkernel -	Time serv	ices – S	Scheduli	ng mechanis	ms Commun	ication and	CO2			
Synchronization – processor and Mult	Event Notification tiprocessor task s	n and Software interrupt Task as scheduling - Clock-driven and pr	ssignment iority-base	and Sch d sched	neduling uling alg	<ul> <li>Task alloca</li> <li>orithms Faul</li> </ul>	ation algorithr t tolerant sch	ns - Single- eduling.				
UNIT-III	Real time Da	itabases				Periods:	9					
Real time Databas improve predictabil	es – Transaction ity	priorities – Concurrency contro	l issues – l	Disk sch	neduling	algorithms –	Two phase a	approach to	CO3			
UNIT-IV	Large Data S	Storage				Periods:	9					
Hard Disks- Netwo System Design- Ca	rked Attached St aching-Legacy Sy	orage-Scalability issues- Networ ystems.	king issues	s. Storag	ge Archit	ecture - Stor	age Partitioni	ng- Storage	CO4			
UNIT-V	Storage Area	a Networks				Periods:	9					
Storage Area Net and Security issue	tworks – Hardwa es. Recent Trenc	are and Software Components, S ds related to Copy data managen	Storage-Cl ment Erasu	usters/G re codir	Frids. Stong- and Stong-and Store	orage QoS– oftware defir	Performance ned storage a	, Reliability, ppliances.	CO5			
Lecture Period	e: 30	Tutorial Periods: 15	Practic	al Poric	nde: -	•	Total Perior	le: 45	1			
Text Books	3. 50		Tactice		Jus			лэ. ту				
1. C.M. Kris 2. Jane W.S 3. Sanjoy E Internatio	shna, Kang G. S S. Liu, Real-Tin Baruah, Marko onal Publishing s	Shin – Real Time Systems, M ne Systems", Pearson Educa o Bertogna, Giorgio Buttazz , 2015.	lcGraw Hi tion India, co, Multip	II Educ 2002. rocesso	ation; 1 <sup>s</sup> or Sche	<sup>st</sup> Edition, 20	017. Real-Time	Systems,	Springer			
1. Hermann	- Kopetz Real-	Time Systems: Design Princi	ples for D	istribute	ed Emb	edded Annl	ications 4th	Edition 20	)11.			
2. Robert S 3. Phillip A. 4. Qing Li, ( 5. Christoph	palding and Da Laplante, Real Caroline Yao, F ner Poelker, Ale	aniel J. Worden, Storage Netv I-Time Systems Design and A Real-Time Concepts for Embe ex Nikitin, Storage Area Netw	vorks: The Analysis: T edded Sys	e Comp ools fo stems, fo	olete Re or the Pr 1 <sup>st</sup> editions. 2 <sup>nd</sup> e	ference, 1 <sup>st</sup> actitioner, 3 on, 2003. dition, 2009	edition, 200 B <sup>rd</sup> edition, 2	004.				
		<u></u>										
	2-13											

- 1. https://datascience.columbia.edu/research/centers/computing-systems-for-data-drivenscience/https://www.guru99.com/what-is-tableau.html
- 2. https://www.geeksforgeeks.org/real-time-operating-system-rtos/
- 3. https://hazelcast.com/glossary/real-time-database/
- 4. https://www.simplilearn.com/big-data-storage-article
- 5. https://www.techtarget.com/searchstorage/definition/big-data-storage

### \* TE – Theory Exam, LE – Lab Exam

#### **COs/POs/PSOs Mapping**

COs		Progra	m Out	Program Specific Outcomes (PSOs)					
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	3	2	-	-	-	1	2	1
2	3	3	3	-	1	-	2	2	1
3	2	3	2	1	2	-	2	2	1
4	3	3	3	1	3	-	2	2	1
5	3	3	3	1	3	-	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ious Asse	essment Marks	(CAM)	End Semester	Total
	CAT 1	CAT 2	Model Exam	Examination (ESE) Marks	Marks		
Marks	1	0	15	10	5	60	100

Department	Artific	ial Intelligence and Data Science	Program	me: M	.Tech.								
Semester	I		Course	Catego	ry: <b>PC</b>	*End	Semester	Exam Typ	e: TE				
Course Code		77402	Perio	ds / We	ek	Credit	Maxi	mum Mark	S				
Course Code	PZUAI	J1103	L	Т	Р	С	CAM	ESE	TM				
Course Name	Artific Svste	ial Intelligence and Intelligent	3	-	-	3	40	60	100				
	0,000												
Prereguisite	-		L		L								
	On co	mpletion of the course, the studer	nts will be	e able t	O			BT Ma (Highes	apping t Level)				
Course Outcomes	CO1	Acquire an insight into the different for which solutions are difficult to explore the solutions are difficult to explore the solution of the	search te xpress usi	chniqu ng the	es to so traditior	olve real world nal algorithmic	l problems capproach	K	3				
	CO2	Learn the different approaches of develop systems that demonstra uncertainty	knowled te intellig	ge repi jent be	resentat ehavior	tion and reas including de	oning and aling with	КЗ					
	CO3	<b>CO3</b> Formulate solutions by applying the planning and learning approaches to real world problems.											
	CO4	CO4 Learn the intelligent computing models and explore the ways in which real-world problems can be solved by adapting the working principle of nature inspired intelligence											
	<b>CO5</b> Examine case studies, learn the benefits of hybridization and propose new hybrid algorithms and validate their results.												
UNIT-I	Introd	uction and Search Techniques				Periods: 9							
History of AI, Proble Best-first search, G – AND/OR Graphs,	em-solvi reedy se , Constra	ng through search, state-space, blind sea earch, A* search, AO* search, Adversaria aint satisfaction problem, Means Ends An	arch techni I search: M nalysis.	ques: B lini-max	FS, DFS search,	S, UCS, Heurist alpha-beta cut	tic search te off, Probler	chniques - n reduction	CO1				
UNIT-II	Know uncer	ledge Representation Techniques tainty	and Rea	soning	under	Periods: 9							
Approaches for kn Resolution, Semar Probability Theory,	owledge ntic netv Bayes F	representation, Propositional Logic, Pr vorks, Forward Chaining, Backward C Rule, Bayesian Belief Networks.	edicate Lo Chaining,	gic, Ru Jnificati	le based on an,	d knowledge re Resolution, M	epresentatio anaging U	n, Conflict ncertainty–	CO2				
UNIT-III	Plann	ing and Learning				Periods: 9		k					
State space plannir by taking advice, E Learning.	ng, partia xplanatio	al order planning, Planning graphs, Plann on based learning, Supervised and Unsur	ing under o bervised le	uncertai arning, I	nty, Leai Decision	rning Types- Ro trees based le	ote Learning arning, Reir	g, Learning 1forcement	CO3				
UNIT-IV	Intelli	gent Computing Models				Periods: 9		L					
Introduction to Inte Networks- Types, A Evolutionary Algorit	elligent S Activation thms- Ge	Systems, knowing when to use Intellige n functions, Learning algorithms, Fuzzy L enetic Algorithm, Swarm intelligence- Par	ent Systen Logic Fuzzy rticle Swar	ns, Mod / sets a n Optim	les of in nd opera nization /	itelligent intera ations, Fuzzy R Algorithm.	ction, Artificules, Fuzzy	cial Neural Inference,	CO4				
UNIT-V	Hybrid	d Intelligent Systems		0		Periods: 9	0						
Need for hybridiz Neural Networks,	Case st	udies on the applications of hybrid Intellig	gence tech	niques	s, Evolu	tionary Fuzzy s	Systems, E	volutionary	CO5				
Lecture Period	s: 30	Tutorial Periods: 15	Practica	al Peric	ods: -	То	tal Period	ls: 45					
Text Books													
1. N.P.Padh 2. Adrian A. 3. Stuart Ru	ny, Artifi Hopgoo issell ar	cial Intelligence and Intelligent system od,Intelligent Systems for Engineers and Pet er Norvig, Artificial Intelligence	ms,1 <sup>st</sup> edi and Scier e: A Mode	tion,Ox tists,4 <sup>tt</sup> rn App	ford,20 <sup>h</sup> editior roach, 4	05. 1,2021. <sup>4th</sup> edition, 202	21.						
Reference Book	S												
<ol> <li>Stuart J F</li> <li>Geoff Hu</li> <li>Crina Gr</li> <li>Library B</li> <li>Michael N</li> </ol>	Russell, Iten, Bu osan ai ook 17, Negnevi	Peter Norvig, Artificial Intelligence- A ilding Intelligent Systems - A Guide t nd Ajith Abraham, Intelligent System 2011. tsky, Artificial Intelligence: A Guide to	A Modern to Machin ms- A Mo o Intellige	Approa e Learr dern A nt Syste	ach, 4 <sup>th</sup> hing Eng hpproac ems, 3 <sup>rr</sup>	Edition, Pears gineering, Apr h, Springer Ii <sup>d</sup> edition, 201	son Educa ess, 1 <sup>st</sup> ec ntelligent \$ 1.	tion, 2020 lition, 2018 Systems F	3. Reference				
5. Christoph	ner M. E	sishop, Pattern Recognition and Mac	hine Lear	ning, 1º	st Editio	n, 2006.							

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Web R	eferences
1.	https://www.ibm.com/topics/data-science
2.	https://www.oracle.com/in/what-is-data-science/
3.	https://u-next.com/blogs/data-science/importance-of-data-science/
4.	https://monkeylearn.com/text-analysis/
5.	https://www.toptal.com/designers/data-visualization/data-visualization-tools

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

### **COs/POs/PSOs Mapping**

COs		Progra	m Out	Program Specific Outcomes (PSOs)					
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	3	2	-	-	-	1	2	1
2	3	3	3	-	1	-	2	2	1
3	2	3	2	1	2	-	2	2	1
4	3	3	3	1	3	-	2	2	1
5	3	3	3	1	3	-	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ious Asse	(CAM)	End Semester	Total	
	CAT 1	CAT 2	Model Exam	Examination (ESE) Marks	Marks		
Marks	10		15	10	5	60	100

Department	Artific	ial Intelligence and Data Science	Programme: M.Tech.							
Semester	I		Course	Catego	ory Code	e: <b>HS</b> *En TE	d Semest	er Exam T	ype:	
Course Code	P23H	STC01	Perio	ds / We	eek	Credit	Ma	ximum Ma	ırks	
	1 2011		L	Т	Р	С	CAM	ES E	ТМ	
Course Name	Rese	arch Methodology and IPR	2	-	-	2	40	60	100	
Prerequisite	No pre	requisite needed		<u>.</u>	.ii			L		
	On co	mpletion of the course, the studer	nts will b	e able	to			BT Ma (Highest	pping Level)	
_	CO1	Gain Knowledge to formulate the re	search pi	roblem.				K2		
Course Outcomes	CO2	Understand the concepts to carry of analysis.	ut the lite	rature r	eview, e	ethics and re	search	K	2	
	CO3	Explain the way of writing technical	entation	methods.		K	2			
	CO4	Ability to understand that today's wo	orld is con	trolled	by Com	puter, Inform	nation	K	2	
		Technology, but tomorrow world will	ept, and cre	ativity.						
	CO5	Ability to understand about IPR and	filing pat	ents in	R & D.			K	3	
UNIT-I	Resea	arch Problem Formulation		Periods: 6						
Meaning of researd a research problei data collection – a	ch proble m - scop nalysis -	em- Sources of research problem - criteria be and objectives of research problem. A - interpretation - necessary instrumentati	a character approaches ons.	s of inve	a good r estigatior	esearch proble of solutions f	em - errors or researc	n selecting h problem	) CO1	
UNIT-II	Litera	ture Review				Periods: 6			_	
Effective literature	studies	approaches - analysis - plagiarism and	research e	ethics					CO2	
UNIT-III	Techr	nical Writing /Presentation				Periods: 6				
Effective technical Presentation and a	writing assessm	<ul> <li>how to write report – paper - developing nent by a review committee.</li> </ul>	a researc	h propo	sal - forr	nat of researc	h proposal	-	CO3	
UNIT-IV	Introd	luction To Intellectual Property Rig	hts (IPR	)		Periods: 6				
Nature of intellectu research – innova procedure for gran	ual prope tion – pa nts of par	erty: patents – designs - trade and copyri atenting - development. International scer tents - patenting under pct.	ght. Proce nario: inter	ss of pa national	tenting a coopera	and development ation on intelle	ent: techno ctual prope	logical erty -	CO4	
UNIT-V	Intelle	ectual Property Rights (IPR)				Periods: 6				
Patent Rights: So Indications - New Traditional knowl	cope of I / Develo ledge Ca	Patent Rights - Licensing and transfer of pments in IPR - Administration of Patent ase Studies - IPR and IITs.	technology System -	/ - Patei IPR of E	nt inform Biological	ation and data Systems - Co	bases - Go mputer Sc	eographica oftware etc.	CO5	
Lecture Period	ds: 30	Tutorial Periods: -	Practica	al Perio	ods: -	T	otal Peric	ods: 30		
Text Books						<u>.</u>				
1. Stuart Melville Kenwyn Publishe 2. Wayne Godda 2001.	e and W er, 1996 ard and	/ayne Goddard, "Research methodolo 5. Stuart Melville, "Research Methodolo	ogy: An ir ogy: An Ir	ntroduc <sup>:</sup> ntroduc	tion for s tion", La	science & Er ansdowne Pu	igineering Iblisher, S	students' Second Ed	, ition,	
3. C.R. Kothari, ( 2018.	Gaurav	Garg, "Research Methodology: Meth	ods and	Techni	ques", N	lew Age Inte	rnational,	Fourth Ec	dition,	
Keterence Bool	KS		1	0007						
2. Ranjit Kumar, 3. Trochim, "Res 4. Fink A, "Cond	"Resea earch Nucting F	arch Methodology: A Step by Step Gu Methods: The concise knowledge bas Research Literature Reviews: From th	uide for be se", Atom	2007. eginner ic Dog et to Pa	rs", Seco Publish iper", Sa	ond Edition, 2 ing, 2005. age Publicati	2010. ons, 2009	).		
Web Reference	S									
1. https://www.so 2. https://www.is 3. https://www.w 4. https://lecturei 5. https://iare.ac.	cribd.co ical.ac. ipo.int/e notes.ir .in/sites	m/document/427419672/Research-M in/~palash/research-methodology/RM edocs/pubdocs/en/intproperty/958/wij n/m/21513-research-methodology /default/files/MTECH-CAD.CAM-R18	/lethodolo /l-lec9.pd po_pub_§ 8-RM-IP-N	ogy-and f )58_3.p NOTES	d-lpr odf .pd					

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# COs/POs/PSOs Mapping

COs		Progra	m Out	)	Program Specific Outcomes (PSOs)				
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	3	2	1	1	2	1	3	3	2
2	3	2	1	1	2	1	3	2	2
3	3	2	1	1	2	1	3	2	2
4	3 2		1	1	3	1	3	2	3
5	3	2	1	1	2	1	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High \* TE – Theory Exam, LE – Lab Exam

### **Evaluation Method**

	(	Contin	uous As	sessment Marks	s (CAM)	End	
Assessment	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Semester Examination (ESE) Marks	Total Marks
Marks	1	0	15	10	5	60	100

\*\*Assignment to be given from Unit-5



Department	Artifi	cial Intel	ligence and Data Scien	nce Program	nme: <b>M</b>	.Tech.				
Semester	I			Course	Catego	ory: <b>PC</b>	*E L	nd Semest E	er Exam	Туре:
Course Code	D33V			Peri	ods / We	eek	Credit	Ma	ximum Ma	arks
Course Coue	FZJA	DFIUI		L	Т	Р	С	CAM	ESE	TM
Course Name	Mach Labo	ine Lear ratory	ning Algorithms	-	-	4	2	50	50	100
Prerequisite	Know	ledge ab	out Machine Learning Al	lgorithms		<u> </u>				
•	On co	ompletio	n of the course, the stu	udents will b	e able	to			BT M (Highe	apping st Level)
Course Outcome	C01	Evalua comple	te the algorithm's / progr xity.	am's efficien	cy in ter	ms of tir	ne and spa	ace	ŀ	<b>∢</b> 4
S	CO2	Solve t	he given problem by ider	ntifying the a	ppropria	ate Data	Structure.		ŀ	<b>{</b> 3
	CO3	Constr	uct various applications b	based on sor	ting and	l tree dat	a structure	).	ł	<b>{2</b>
	CO4	Apply g and line	raph data structures to s ar programming.	solve real tim	e applic	ations su	ich as netv	work flow	ŀ	<b>&lt;</b> 3
	CO5	Illustrat	e the performance of the	e polynomial	time alg	jorithm.			ŀ	<b>{2</b>
List of Exercis 1. Support 2. Naive B 3. K-Neare 4. Linear F 5. K-Mean 6. Principa 7. Decision 8. Naïve B 9. Randon 10. Adaboo	ses Vector ayes est Neigl Regressi as and K al Compo n Tree A bayes en n forests st and X	Machine hbor on and Lo -Medians onent Ana lgorithm isemble GBoost	gistic Regression lysis and Linear Discrimina	ant Analysis						
Lecture Period	s:		Tutorial Periods: -	Practic	al Peric	ods: 45	•	Total Perio	ods: 45	
Reference Book	s									
1. Andreas edition,	s C. Mu 2016.	ueller an	d Sarah Guido, "Introdu	iction to Mad	hine Le	earning v	vith Pytho	n", O'Reilly	∕ Media, I	Inc. First

 Henrik Brink, Joseph W. Richards, and Mark Fetherolf, "Real-World Machine Learning", Manning Publications, 2017.
 Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", The MIT Press, 2nd Edition, 2009.

\* TE – Theory Exam, LE – Lab Exam

# COs/POs/PSOs Mapping

COs		Progra	m Out	comes	s (POs)		Program Specific Outcomes (PSOs)			
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	
1	2	2	2	3	2	2	3	2	2	
2	1	2	2	2	2	2	3	2	2	
3	1 3 3 3				3	3	3	3	3	
4	2	2         3         3         3         3           1         3         3         3         3		3	3	3	3	3		
5	1			3	3	3	3	3		

Correlation Level: 1 - Low, 2 - Medium, 3 - High

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	Co	ntinuous A	AM)					
Assessment	Performan cla	ce in pract asses	ical	Model		End Semester	Total Marks	
	Conduction of practical	Record work	viva	Practical Examination	Attendance	Examination (ESE) Marks		
Marks	15	5	5	15	10	50	100	

Department	Artifi	cial intelligence and Data Science	Program	nme: <b>M</b>	.Tech.				
Semester	I		Course Category Code: HS *End Semester LE						Туре:
Course Code	อววม	SPC01	Perio	ods / We	ek	Credi	t Ma	aximum M	arks
Course Coue	гдэп	3F601	L T P			С	CAM	ESE	TM
Course Name	Tech	nical Report Writing and Seminar	-	-	4	2	100	-	100
(Co	mmon	to all M.Tech Programme)							
Prerequisite					<u>.</u>		<u></u>		
Course	On co	BT M (Highe	BT Mapping (Highest Level)						
	CO1	Select a subject, narrowing the subject into a topic.							
Outcome s	CO2	State an objective and collecting the relevant bibliography (at least 15 journal papers).							
	CO3	Study the papers and understandin analyzing each paper.	ig the aut	hor's co	ontributic	ons and c	ritically		K3
	CO4	Prepare a working outline and linkir paper.	ng the pap	pers and	d prepar	ing a dra	t of the		K2
	CO5	<b>O5</b> Prepare a working outline and linking the papers and preparing a draft of the paper.							K2
List of Experi	ments:								

Activity	Instructions	Submission	Evaluation
Selection of area of interest and Topic	Select an area of interest, topic and state an objective	2 <sup>nd</sup> week	3 % Based on clarity of thought, current relevance and clarity in writing
Stating an Objective	-		
Collecting Information about area & topic	<ol> <li>List 1 Special Interest Groups or professional society</li> <li>List 2 journals</li> <li>List 2 conferences, symposia or workshops</li> <li>List 1 thesis title</li> <li>List 3 web presences (mailing lists, forums, news sites)</li> <li>List 3 authors who publish regularly in your area</li> <li>Attach a call for papers (CFP) from your area.</li> </ol>	3 <sup>rd</sup> week	3% (the selected information must be area specific and of international and national standard)
Collection of Journal papers in the topic in the context of the objective – collect 20 & then filte	<ul> <li>provide a complete list of references you will be using-Based on your objective -Search various digital libraries and Google Scholar</li> <li>When picking papers to read - try to:</li> <li>Pick papers that are related to each other in some ways and/or that are in the same field so that you can write a meaningful survey out of them.</li> <li>Favour papers from well-known journals and conferences, in the field (as indicated in other Favour more recent papers,</li> <li>Pick a recent survey of the field so you can quickly gain an overview, Find relationships with respect to each other and to your topic area(classification scheme/categorization)</li> <li>Mark in the hard copy of papers whether complete work or section/sections of the paper are being considered</li> </ul>	4 <sup>th</sup> week	6% ( the list of standard papers and reason for selection)
Reading and notes for first 5 papers	<ul> <li>Reading Paper Process For each paper form a Table answering the following questions:</li> <li>What is the main topic of the article?</li> <li>What was/were the main issue(s) the author said they want to discuss?</li> <li>Why did the author claim it was important?</li> <li>What simplifying assumptions does the author claim to be making?</li> <li>What did the author do?</li> </ul>		8% ( The table given should indicate your understanding of the paper and

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	<ul> <li>How did the author claim they were going their work and compare it to others?</li> <li>What did the author say were the limitative research?</li> <li>What did the author say were the importation future research?</li> <li>Conclude with limitations/issues not addres paper (from the perspective of survey)</li> </ul>	y to evaluate tions of their ant directions essed by the	6 <sup>th</sup> week	the evaluation is based on your conclusions about each paper)
Reading and notes for next 5 papers	Repeat Reading Paper Process		7 th week	8% (the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper
Draft outline 1 and Linking papers	Prepare a draft Outline, your survey goals, classification / categorization diagram	along with a	8 th week	8% (this component will be evaluated based on the linking and classification among the papers)
Abstract	Prepare a draft abstract and give a present	e a draft abstract and give a presentation 9 th week 6%(Cla conclu 6% Pr		
Introduction Background	Write an introduction and background section	ons	10th week	5% ( clarity)
Sections of the paper	Write the sections of your paper bas classification / categorization diagram in h the goals of your survey	sed on the keeping with	11th week	10% (this component will be evaluated based on the linking and classification among the papers)
Conclusions	Write your conclusions and future work		12th week	5% ( conclusions)
Final Draft       Complete the final draft of your paper       13th week       10% (formatting, English, and linking)         4% Plagiarism Check Report				
Seminar	A brief 15 slides on your paper		14th & 15th week	10% (based on presentation and Vivavoce)
Lecture Periods: -	Tutorial Periods: -	Practical Pe	riods: 45	Total Periods: 45

# COs/POs/PSOs Mapping

COs		Progra	m Out	comes	s (POs)	)	Program Specific Outcomes (PSOs)			
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	
1	2	3	3	1	3	3	2	1	2	
2	2	3	2	1	3	2	2	1	2	
3	2	3	2 1 3		2	2	1	2		
4	2	3	2	1	3	2	2	1	2	
5	2	3	2	1	3	2	2	1	2	

Correlation Level: 1 - Low, 2 - Medium, 3 - High

	Continuo	ous Assessr	nent Marks (CA		End		
Assessment	Weekly Progress	Seminar	Record work	Viva	Attendance	Semester Examination (ESE) Marks	Total Marks
Marks	40	30	10	10	10	-	100

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	Department	Artificial intelligence and Data Science	Program	Programme: M.Tech.					
ľ	Semester	1	Course	Course Category Code: AEC *End Semester Exam Type					
Course Code <b>P23ADC1XX</b>		P234DC1XX	Perio	ds / We	ek	Credit	Ma	ximum Marks	
	Course Coue		L	Т	Р	С	CAM	ES	ТМ
1								E	
-	Course Name	Ability Enhancement Courses	-	-	4	-	100	-	100
÷		<u>i</u>							
t			<u>i</u>	<u></u>	<u>i</u>	<u>.</u>	<u>.</u>	<u>i</u>	.i

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

Semester       I       Course Category: PE       "End Semester Exam Type: TE         Course Code       P23ADEC01       L       T       P       Code       Course Category: PE       "End Semester Exam Type: TE         Course Name       Agile and Software Project       3       -       3       40       60       100         Course Name       Agile and Software Project       3       -       3       40       60       100         Course Name       On completion of the course, the students will be able to       BT Mapping       BT Mapping         Course       Co1 Perform Software engineering processes       K3       K3       K3         Course       Co2 Make use of software testing strategies.       K3       K3       K4         Course angineering concepts - Development atwise - Software development lifecycle modes - Software project management - Software angineering concepts - Development atwise - Software Corganization and Team structures - Staffing - Software Corganization.       Periods: 9         Characteristics of a Good Software Design       Periods: 9       Periods: 9       Corganization and Team structures - Staffing - Software Corganization and Team structures - Staffing - Software Testing Interface Design - Coupling and Cohesion - Structured Analysis - Data Flow Diagrams - State and Staffing - Priods: 9       Characteristics of a Good Software Design - Coupling and Cohesion - Structured Analysis - Data Flow Diagrams - State	Department	Artificial Intelligence and Data Science	Progran	nme: <b>M</b>	.Tech.				
Course Code         P23ADEC01         Periods / Week         Credit         Maximum Marks           Course Name         Agle and Software Project         3         -         3         40         60         100           Course Name         Agle and Software Project         3         -         3         40         60         100           Course Course         Coir Perform Software engineering processes.         K2         Make use of software design.         K2           Course Coir         Periods: 9         Make use of software design.         K3         Coir Make use of different processes         K3           Course Coir         Goir Merce Darightering Processes         Periods: 9         Software Engineering Processes         K3           Software Engineering Processes         Periods: 9         Software Engineering Processes         K3           Course Software Brainers Davelopment activities = Software development filecycle modes = Software project management = Copy and the software Dave of the software Brainer = Copy and the software Dave of the software Copy and the software Dave of the software Copy and the software Dave of the software Copy and the softw	Semester	1	Course	Catego	ory: PE	*Enc	d Semeste	er Exam Typ	e: TE
Course Name       Agle and Software Project       3       -       3       40       60       100         Course Name       Agle and Software Project       3       -       3       40       60       100         Course Name       Agle and Software Project       3       -       3       40       60       100         Prerequiste       -       On completion of the course, the students will be able to       BT Mapping       (Highest Level         Course       CO2       Make use of software engineering processes       K3       K3         CO3       Apply different Software testing strategies.       K3       K3         CO4       Make use of different processes       Periods : 9       Software Engineering Processes       Periods : 9         Software Engineering Processes       Periods : 9       Software Engineering processes       Periods : 9       Software Software Design       Co         Cots Make use of different processes       Periods : 9       Software Software Design       Periods : 9       Software Software Design       Co         Cots Advare Design       Cots Make use of different processes       Periods : 9       Cots advare Software Design Processes       Periods : 9       Cots advare Software Design Processes       Periods : 9       Cots advare Software Design Procesoftware Design Pro	Course Code		Peric	ds / W	eek	Credit	Ma	ximum Mark	S
Course Name       Agiie and Software Project       3       -       3       40       60       100         Management       Common to MTech AI & DS and BDA       Prerequiste       -       3       40       60       100         Prerequiste       -       On completion of the course, the students will be able to       BT Mapping (Highest Level         Course Coll       Perform Software engineering processes       K2         Coll Software Engineering Processes       Periods: 9       K3         Coll Make use of different process of Aglie Methodology.       K3         Coll Make use of different process of Aglie Methodology.       K3         Software Engineering Concepts - Development activations - Structured Analysis - Data Flow Diagrams - Structured and process - Structured Analysis - Data Flow Diagrams - Structured Analysis - Data Flow Diagram - S	Course Code	P23ADEC01	L	Т	Р	С	CAM	ESE	ТМ
Management         BT Mapping           Common to MTech AI & DS and BDA         Prerequisite         On completion of the course, the students will be able to         BT Mapping           Course         COI Perform Software engineering processes.         K2           Outcomes         COI Perform Software design.         K3           CO3 Apply different Aglie Methodology.         K3           CO3 Make use of different Aglie Methodology.         K3           UNIT-I         Software Engineering Processes         Periods: 9           Software Engineering Processes         Periods: 9           Software Engineering Processes         Design Processe           UNIT-I         Software Design Processes         Periods: 9           Contract Engineering Processes         Design Processe         Software Design Processes           UNIT-II         Software Design Processes         Design Processe         Software Design Processe           UNIT-II         Software Design Processes         Descan model - Case des Plane Diversities of a good User Interface         Cod           UNIT-II         Software Testing         Periods: 9         Contracted bias of Software Design Processes         Cod Software Design Processes         Decides	Course Name	Agile and Software Project	3	-	-	3	40	60	100
Common to MTech AI & DS and BDA           Prerequisite         On completion of the course, the students will be able to         BT Mapping           Course         COI         Perform Software engineering processes.         K2           Outcomes         CO2         Make use of software design.         K3           CO3         Apply different software testing strategles.         K3           CO3         Make use of different processes         Periods: 9           Software engineering concepts - Development activities - Software configuration management - Project Planing - Empirad         K3           UNIT-1         Software Design         Course         Cool Software Design         Course           VINT-1         Software Design         Course         Periods: 9         Software Testing Level Stating - Organization and Team structures - Stating - Statuctured and Design - Coupling and Cohesion - Structured Analysis - Data Flow Diagram - Statuctured and Design - Data Flow Diagram - Statuctured and Design - Data Flow Diagram - Statuctured and Design - Coupling and Cohesion - Structured Analysis - Data Flow Diagram - Statuctured and Design - Coupling and Cohesion - Structured Analysis - Data Flow Diagram - Structured Analysis - Data Flow Diagram - Statuctured and Diagrams - Colect Oriented Conegate - UMI Diagrams - Luce acces model - Dises diagram - Acitivity Diagram - State chard diagram - Colect Oriented Conegate - UMI Diagram - Dialed Design - Decide Diagram - Colect Structured Analysis and Design methodology - Characteristics of a goud User Interatose Biolity Design - Coupling and Cohesion - Structu		Management							
Prerequisite         On completion of the course, the students will be able to         IT Mapping           Course         On completion of the course, the students will be able to         IT Mapping           Course         COI Perform Software engineering processes.         K2           Outcomes         CO2 Make use of software design.         K3           CO3 Apply different software testing strategies.         K3           CO5 Make use of different processes         Periods: 9           Software Engineering Processes         Periods: 9           Software Design         Foldware design.           Cos Make use of different Agile Methodology.         K3           UNIT-1         Software Engineering Processes         Periods: 9           Software Design         Foldware design         Foldware design           Contradictification Techniques – Staffing Level Estimation – Scheduling – Okied oneinted concepts – UML Diagrams – Use case model – Class diagrams – Interaction diagrams – Activity         Foldware Methodology           UNIT-11         Software Design         Foldware Design methodology.         Cot           UNIT-11         Software Testing         Periods: 9         Foldware design.         Cot           Marguinents Start Agile Design - Object oneinted concepts – UML Diagrams – Staft fold Design. – Diedect Prevention Strategies – Aluser Interface Design         Cot	Com	imon to MTech AI & DS and BDA							
Course Outcomes         On completion of the course, the students will be able to (Highest Level Outcomes         BT Mapping (Highest Level Outcomes           Course Outcomes         CO1 Perform Software engineering processes.         K2           CO2 Make use of software design.         K3           CO3 Apply different Software testing strategies.         K3           CO4 Illustrate different Agle Methodology.         K3           Software Engineering Processes         Periods: 9           Software Engineering Processes         Periods: 9           Software Engineering Processes         Periods: 9           Contracteristics of a God Software Design         Periods: 9           Contracteristics of a God Software Design         Orgen testing - Software Design         Periods: 9           Contracteristics of a God Software Design         Output design methodology.         Contracteristics of a god Software Design         Contracteristics of a god Software Design         Contracteristics of a god Software Design methodology.         Contracteristics of a god Software Design methodolo	Prerequisite	-							
Course         Course         Coil         Perform Software engineering processes.         K2           Outcomes         CO2         Make use of software design.         K3           CO3         Apply different software testing strategies.         K3           CO4         Illustrate different Aglie Methodology.         K2           CO5         Make use of different processes         Periods: 9           Software Engineering Processes         Periods: 9           Software Engineering Processes         Periods: 9           Software Engineering Processes         Periods: 9           Characteristics of a Good Software Design         Coupling and Cohesion – Structured Analysis – Data Flow Diagrams – Structured and Detailed Design – Object oriented concepts – UNL Diagrams – Use case model – Class digrams – Structured and Detailed Design methodology.         CC           UNIT-II         Software Testing         Periods: 9         Cod           UNIT-II         Software Testing         Periods: 9         Cod           UNIT-II         Software Testing Ufe Cycle.         Cod         Cod           UNIT-II         Software Testing Ufe Cycle.         Cod         Cod           UNIT-IV         Aglie Methodology         Periods: 9         Cod           UNIT-IV         Aglie Methodology         Periods: 9         Cod		On completion of the course, the stude	nts will b	e able	to			BT Ma (Highes	apping at Level)
Outcomes         CO2         Make use of software design.         K3           CO3         Apply different software testing strategies.         K3           CO4         Jilustrate different software testing strategies.         K2           CO5         Make use of different process of Agile Methodology.         K3           Software Engineering oncepts Development activities - Software project management - Project planning - Estimation - Scheduling - Risk management - Software configuration management - Project Planning - Estimation - Scheduling - Risk management - Software activities - Software Design         Corganization and Team structures - Staffing - Software Requirements specification.           VINIT-I         Software Design - Coupling and Cohesion - Structured Analysis - Data Flow Diagrams - Structured and Porces 9         Corganization - Closs diagrams - Interaction diagrams - Structured and Porces 9           UNIT-II         Software Testing - Psychology of Testing - Principles of Software Testing - Deletic Prevention Strategies - Role of a tester - Software Testing Life Cycle.         Corganization - Cord Software Design - Coupling and Cohesion - Structured Actives - Deleti Prevention Strategies - Role of a tester - Software Testing Life Cycle.         Corganization - Software Testing Interface Design - Coupling and Cohesion - Software Testing - Psychology of Testing - Principles of Software Testing - Deletic Prevention Strategies - Role of a tester - Software Testing Life Cycle.         Corganization of Agile Methodology.           UNIT-II         Software Testing Interface Design methodology.         Periods: 9         Corgitest	Course	CO1 Perform Software engineering proce	sses.					K	2
C03         Apply different software testing strategies.         K3           C04         Illustrate different Agile Methodology.         K2           C05         Make use of different processes         Periods: 9           Software Engineering Concepts – Development activities – Software development lifecycle models – Software project management – Project Planning – Empirical Testimation – Scheduling – Nisk management – Software Configuration management – Project Planning – Empirical – Software Design         C0           UNIT-I         Software Design – Coupling and Cohesion – Structured Analysis – Data Flow Diagrams – Structured and Signams – Structured analysis and Design methodology – Characteristics of a good Software Design – Object oriented Analysis – Data Flow Diagrams – Structured and Signams – Structured analysis and Design methodology – Characteristics of a good Software Design – Periods: 9           UNIT-II         Software Testing         Periods: 9           Construct testing         Periods: 9         Periods: 9           UNIT-II         Software Testing Line Cycle.         CC           UNIT-II         Software Testing Line Cycle.         CC           UNIT-II         Software Testing Line Cycle.         CC           UNIT-IV         Agile Methodology         Periods: 9           Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model – Classification of Agile Methodol         CC           UNIT-V         Agile Methodology         <	Outcomes	CO2 Make use of software design.						K	3
Cod         Illustrate different Agile Methodology.         K2           Cod         Cod         Mixet ac different process of Agile Methodology.         K3           UNIT-1         Software Engineering Processes         Periods: 9           Software engineering concepts - Development activities - Software development lifecycle models - Software project Planning - Estimation - Scheduling - Risk management - Software onfiguration and Team structures - Staffing - Software Testing         Cc           Requirements specification.         UNIT-1         Software Design - Coupling and Cohesion - Structured Analysis - Date Flow Diagrams - Structured and Periods: 9           Characteristics of a Good Software Design - Duplet Oriented Analysis and Design methodology - Characteristics of a good User Interface - Types - A User Interface Design methodology of Testing - Principles of Software Testing         Periods: 9           Introduction to Software Testing         Periods: 9         Cc           UNIT-1         Software Testing         Cc           UNIT-1         Software Testing         Cole           Cod         Software Testing         Cole           UNIT-1         Software Testing         Cole           Cod         Alge Mathedology         Periods: 9           Introduction to Software Testing         Periods: 9         Cc           UNIT-1         Agile Mathedology         Periods: 9         Cc <t< td=""><td></td><td>CO3 Apply different software testing strate</td><td>eaies</td><td></td><td></td><td></td><td></td><td>ĸ</td><td>3</td></t<>		CO3 Apply different software testing strate	eaies					ĸ	3
COS         Make use of different process of Agile Methodology.         K3           UNIT-1         Software Engineering Processes         Periods: 9           Software engineering concepts – Development activities – Software development lifecycle models – Software project management – Project Planning – Empirical Estimation – Scheduling – Risk management – Software configuration management – Project Planning – Empirical Estimation Techniques – Staffing Level Estimation – Scheduling – Organization and Team structures – Staffing – Software Regularements specification.         CC           UNIT-11         Software Design         Periods: 9         Contracteristics of a Good Software Design – Coupling and Cohesion – Structured Analysis – Data Flow Diagrams – Structured and Detailed Design – Object oriented concepts – UML Diagrams – Use case model – Class diagrams – Structured and Detailed Design – Object oriented concepts – UML Diagrams – Use case model – Class diagrams – Structured and Detailed Design – Object oriented Analysis and Design methodology – Characteristics of a good Obser Interface – Types – A User Interface Design methodology.         CC           UNIT-11         Software Testing Unoduction to Software Testing Ule Cycle.         CC           UNIT-14         Agile Methodology         Periods: 9           Introduction to Software Testing Ule Cycle.         CC           UNIT-14         Agile Methodology         Periods: 9           Introduction – Software Testing         Periods: 9           UNIT-14         Agile Methodology         Periods: 9           UNIT		CO1 Illustrate different Agile Methodology	,					V	ັ ົ
COS         Make use of different processes         Periods: 9           UNIT-1         Software engineering concepts – Development activities – Software development lifecycle models – Software project management – Software         Concepts – Development activities – Software development lifecycle models – Software Project planning – Empirical         Concepts – Development activities – Software development lifecycle models – Software Project planning – Empirical         Concepts – Development – Software Design – Scheduling – Organization and Team structures – Staffing – Software Design – Coupling and Cohesion – Structured Analysis – Data Flow Diagrams – Structured and Concepts – Development – Concepts – Development – Software Design – Object Oriented Analysis and Design methodology – Characteristics of a good User Interface Design methodology.         Concepts – Development – Software Development – Software Testing – Periods: 9           UNIT-III         Software Testing Life Cycle.         Concepts – Development – Aglie Software Development – Traditional Model vs. Aglie Model – Classification of Aglie Methods         Concepts – Development – Aglie Software Development – Adaptive Software Development – Case (a tester – Software Testing Life Cycle.         Concepts – Development – Aglie Software Development – Adaptive Software Development – Case (a tester – Software Testing Life Cycle.         Concepts – Development – Aglie Project Management – Aglie Team Interactions – Ethics in Aglie Methods         Concepts – Development – Aglie Border Classification of Aglie Methods         Concepts – Development – Aglie Project Management – Aglie Team Interactions – Ethics in Aglie Teams – Aglity in Design – Aglie Project Management – Aglie Team Interactions – Ethics in Aglie Teams – Aglity in Design – Development – Adaptive			/. 					n v	2
UNIT-I         Software Engineering Processes         Periods: 9           Software engineering concepts - Development activities - Software configuration management - Project Planning - Empirical         CC           Software engineering concepts - Development activities - Software configuration management - Project Planning - Empirical         CC           Constructions - Scheduling - Crganization and Team structures - Staffing - Software Requirements specification.         Periods: 9           Characteristics of a Good Software Design - Coupling and Cohesion - Structured Analysis - Data Row Diagrams - Structured and Consers - A User Interface Design methodology.         CC           UNIT-II         Software Testing - Psychology of Testing - Principles of Software Testing - Defects - Defect Prevention Strategies - Consers - Software Testing - Psychology Divers, Capabilities and Values.         Periods: 9           Numer VIII-V         Agile Methodology         Periods: 9           Consers for Agile Management - Agiles Software Development - Traditional Model vs. Agile Model - Classification of Agile Methods - Agile Divers, Capabilities and Values.         CC           UNIT-V         Agile Documentations - Agile Divers, Capabilities and Values.         Periods: 9           UNIT-V         Agile Project Software Development - Adaptive Software Development - Extreme Programming: CC           Design - Software Development - Adaptive Software Development - Extreme Programming: CC           Lean Production - SCRUM, Crystal, Feature Drivers Agaptive Software Development - Extreme Programmin	· · · · · · · ·	CO5 Make use of different process of Agi	le Methoc	lology.				K	3
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Lean Production – SCRUM, Crystal, Feature Driven Development – Adaptive Software Development – Extreme Programming:       CC         Method Overview – Lifecycle – Work Products, Roles and Practices.       Total Periods: -       Total Periods: 45         Lecture Periods: 30       Tutorial Periods: 15       Practical Periods: -       Total Periods: 45         Text Books       1       Ian Sommerville, "Software Engineering", Pearson Education, Eighth edition, 2008.       Craig Larman, "Agile and Iterative Development – A Manager"s Guide", Pearson Education, 2010.       Elisabeth Hendrickson, "Agile Testing" Quality Tree Software Inc, 2012.         Reference Books       1       Hazza and Dubinsky, "Agile Software Engineering: A Practitioner's Approach", McGraw-Hill International Edition, Seventh Edition, 2009.         2. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw-Hill International Edition, Seventh Edition, 2009.         3. David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constrair for Business Results", Prentice Hall, 2003.         4. Object-Oriented Systems Analysis and Design, McGraw-Hill Higher Education; 4 <sup>th</sup> Edition, 2010.         5. Robert C Martin, "Agile Software Development, Principles, Patents and Practices", Prentice Hall, 2012.	UNIT-V	Agile Processes				Periods: 9		i	
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<ul> <li>Text Books</li> <li>1. Ian Sommerville, "Software Engineering", Pearson Education, Eighth edition, 2008.</li> <li>2. Craig Larman, "Agile and Iterative Development–A Manager"s Guide", Pearson Education, 2010.</li> <li>3. Elisabeth Hendrickson, "Agile Testing" Quality Tree Software Inc, 2012.</li> <li>Reference Books</li> <li>1. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.</li> <li>2. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw-Hill International Edition, Seventh Edition, 2009.</li> <li>3. David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constrair for Business Results", Prentice Hall, 2003.</li> <li>4. Object-Oriented Systems Analysis and Design, McGraw-Hill Higher Education; 4<sup>th</sup> Edition, 2010.</li> <li>5. Robert C Martin, "Agile Software Development, Principles, Patents and Practices", Prentice Hall, 2012.</li> </ul>	Lecture Period	ls: 30 Tutorial Periods: 15	Practic	al Perio	ods: -	Т	otal Perio	ods: 45	
<ol> <li>Ian Sommerville, "Software Engineering", Pearson Education, Eighth edition, 2008.</li> <li>Craig Larman, "Agile and Iterative Development–A Manager"s Guide", Pearson Education, 2010.</li> <li>Elisabeth Hendrickson, "Agile Testing" Quality Tree Software Inc, 2012.</li> <li>Reference Books         <ol> <li>Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.</li> <li>Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw-Hill International Edition, Seventh Edition, 2009.</li> <li>David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constrair for Business Results", Prentice Hall, 2003.</li> <li>Object-Oriented Systems Analysis and Design, McGraw-Hill Higher Education; 4<sup>th</sup> Edition, 2010.</li> <li>Robert C Martin, "Agile Software Development, Principles, Patents and Practices", Prentice Hall, 2012.</li> </ol> </li> </ol>	Text Books								
<ol> <li>Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.</li> <li>Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw-Hill International Edition, Seventh Edition, 2009.</li> <li>David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constrair for Business Results", Prentice Hall, 2003.</li> <li>Object-Oriented Systems Analysis and Design, McGraw-Hill Higher Education; 4<sup>th</sup> Edition, 2010.</li> <li>Robert C Martin, "Agile Software Development, Principles, Patents and Practices", Prentice Hall, 2012.</li> </ol>	<ol> <li>Ian Sommery</li> <li>Craig Larman</li> <li>Elisabeth He</li> </ol>	ville, "Software Engineering", Pearson Educa n, "Agile and Iterative Development–A Mana Indrickson, "Agile Testing" Quality Tree Softv	ation, Eigh Iger"s Gui ware Inc, 2	nth editi de", Pe 2012.	on, 200 arson E	8. Education, 20	10.		
<ol> <li>Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw-Hill International Edition, Seventh Edition, 2009.</li> <li>David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constrair for Business Results", Prentice Hall, 2003.</li> <li>Object-Oriented Systems Analysis and Design, McGraw-Hill Higher Education; 4<sup>th</sup> Edition, 2010.</li> <li>Robert C Martin, "Agile Software Development, Principles, Patents and Practices", Prentice Hall, 2012.</li> </ol>	1. Hazza and D	 Jubinsky, "Agile Software Engineering. Serie	s: Undera	raduate	e Topics	s in Compute	r Science	e", Springer.	2009.
<ol> <li>David J. Anderson and En Schragenheim, Agne Management for Software Engineering. Applying the Theory of Constrain for Business Results", Prentice Hall, 2003.</li> <li>Object-Oriented Systems Analysis and Design, McGraw-Hill Higher Education; 4<sup>th</sup> Edition, 2010.</li> <li>Robert C Martin, "Agile Software Development, Principles, Patents and Practices", Prentice Hall, 2012.</li> </ol>	2. Roger S. Pr Edition, 2009	essman, "Software Engineering: A Practitio ).	oner's Ap	proach	", McG	raw-Hill Inter	rnational	Edition, Sev	/enth
5. Robert C Martin, "Agile Software Development, Principles, Patents and Practices", Prentice Hall, 2012.	for Business 4. Object-Orien	Results", Prentice Hall, 2003. Ited Systems Analysis and Design, McGraw-	Hill Highe	er Educ	ation; 4	th Edition, 20	10.		
$\sim \wedge \rightarrow \sim$	b. Kobert C Ma		s, Patents		ractices	, Prentice H	aii, 2012.		

- 1. https://www.coursera.org/courses?query=software%20engineering
- 2. https://www.edx.org/learn/software-engineering
- 3. https://www.udemy.com/courses/development/software-engineering/
- 4. https://www.coursera.org/learn/agile-software-development
- 5. https://www.tutorialspoint.com/sdlc/sdlc\_agile\_model.htm

### \* TE – Theory Exam, LE – Lab Exam

### **COs/POs/PSOs Mapping**

COs	I	Progra	m Out	Program Specific Outcomes (PSOs)					
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	3	2	-	-	-	1	2	1
2	3	3	3	-	1	-	2	2	1
3	2	3	2	1	2	-	2	2	1
4	3	3	3	1	3	-	2	2	1
5	3	3	3	1	3	-	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ous Asse	essment Marks (	(CAM)	End Semester	Total
	CAT 1	CAT 2	Model Exam	Attendance	Examination (ESE) Marks	Marks	
Marks	1	0	15	10	5	60	100

Department	Artificial Intelligence and Data Science Programme: M.Tech.										
Semester	I		Course	Catego	ry: PE	*End	I Semester	Exam Typ	be: TE		
Course Code	P234	DF101	Perio	ds / We	ek	Credit	Maxi	mum Mar	ks		
	0/		L	Т	Р	С	CAM	ESE	ТМ		
Course Name	Pythe	on for Data Science	3	-	-	3	40	60	100		
	r										
Prerequisite	Pytho	n Basics							-		
	On co	ompletion of the course, the studer	nts will be	e able f	to			BT M (Highes	apping st Level)		
Course	CO1	Explain the roles and stages of data	science p	rojects		K2					
Outcomes	CO2	Explain data structures provided by p	bandas ar	id num	py libra	ary for data a	nalysis	ŕ	(2		
	CO3	Perform data wrangling, cleaning and	d transfor	mation	using p	ython	-	ŕ	(2		
	CO4	Apply matplotlib for plotting and visua	alizing the	datase	ets	·		k	(3		
	CO5	Demonstrate data aggregation and ti	ime series	analys	sis usin	g python pro	gramming	ľ	(3		
UNIT-I	Intro	duction to Data Science				Periods: 9	<u> </u>				
Data science proce Exploring data – M	n relational d	atabases -	CO1								
UNIT-II	Basio	cs of Numpy, Pandas, and Vectoriz	ed Comp	utatior	1	Periods: 9					
The Numpy ndarra	y: A Mu	Processing	CO2								
Using Arrays - File	Input a	nd Output with Arrays – Linear Algebra –	Random N	Number	Genera	tion – Randon	n Walks. Intr	oduction to	)		
Hierarchical Indexir	ng.	Essential Functionality – Summarizing a	na Compu	ing Des	scriptive	Statistics – H	and ing wiss	sing Data -	-		
UNIT-III	Data	Preprocessing, Wrangling, and Tra	ansformation	tion		Periods: 9					
Data preprocessing	g: Read	ling and Writing Data in Text Format – E	Binary Data	a Forma	ats – Inte	eracting with H	HTML and V	veb APIs -			
Data wrangling and	tabases	ormation: Combining and Merging Data \$	Sets – Res	haping	and Piv	oting – Data 1	Fransformati	on – String	CO3		
Manipulation – USI	DA Foo	d Database									
UNIT-IV	Plotti	ing and Visualization	- 11:		11	Periods: 9		- Duth -			
A Brief matplot lib Visualization Tool E	Ecosyst	mer – Plotting Functions in pandas – Pic em.	otting Map	s: visua	alizing H	aiti Eartnquak	e Crisis Dat	a – Pythor	CO4		
UNIT-V	Data	Aggregation, Group Operations an	d Time S	eries		Periods: 9					
Data aggregation a Pivot Tables and C	and grou	up operations: GroupBy Mechanics – Dat	a Aggrega	tion – G	Froup-wis	se Operations	and Transfo	ormations -	CO5		
Time series: Date a	and Tim	ne Data Types and Tools – Time Series	Basics – D	ate Rar	nges, Fre	equencies, an	d Shifting –	Time Zone	>		
Handling – Periods	s and F	Period Arithmetic – Resampling and Fre	quency Co	onversio	n – Tim	ne Series Plot	ting – Movii	ng Window	1		
Lecture Periods: 45 Tutorial Periods: - Practical Periods: - Total Periods: 45											
Text Books			L			I					
1. William Mo 2017.	cKinne	y, "Python for Data Analysis – Data W	Vrangling	with Pa	andas, N	NumPy and I	Python", O'	Reilly, 2 <sup>nd</sup>	edition,		
2. Jake Vand	derPlas	s, "Python Data Science Handbook –	Essential	tools fo	or worki	ng with data"	', O'Reilly, ′	1 <sup>st</sup> edition,	2016.		
3. Fabio Nell	li, "Pytr	non Data Analytics with Pandas, Num	Py, and N	latplotli	b", 2 <sup>na</sup> (	edition, 2018					
Reference Book	S										
1. John Pau	ul Muel	ler, Luca Massaron, "Python for Data Jazar, "Data Science and Analytics wi	Science f	or Dum	nmies", Press	John Wiley&	Sons, 2 <sup>nd</sup> (	edition, 20	)19. tion 2017		
3. Mark Lut	z, Laur	a Lewin, Frank Willison. "Programmin	ng Python	, ORO ', O'Re	illy Med	lia, 3 <sup>rd</sup> editior	1, 2006.	ip, is edi			
4. Eric Matt	hes, "F	Python Crash Course: A Hands-on, Pr	oject-bas	ed Intro	oduction	to Program	ming", $2^{nd} \in$	dition, 20	19		
5. Al Sweiga	5. Al Sweigart, "Automate the Boring Stuff with Python: Practical Programming for Total Beginners", 1 <sup>st</sup> edition, 2015										

- https://nptel.ac.in/courses/106/106/106106212/
   https://www.geeksforgeeks.org/data-analysis-visualization-python/
   https://www.coursera.org/learn/python-data-analysis
- 4. https://www.python.org
- 5. https://www.datacamp.com/courses/statistical-thinking-in-python-part-1

5. AS ---

# COs/POs/PSOs Mapping

COs		Progra	m Out	Program Specific Outcomes (PSOs)					
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	2	1	2	2	3	2	2
2	1	2	2	2	2	2	3	2	2
3	2	3	3	1	3	3	3	3	3
4	2	3	3	1	3	3	3	3	3
5	2	3	3	1	3	3	3	3	

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ious Asse	essment Marks(	CAM)	End Semester	Total
	CAT 1	CAT 2	Model	Assignment*	Attendance	Examination(ESE)	Marks
			Exam			Marks	
Marks	10		15	10	5	60	100

Department	Artific	cial Intel	ligence and Data Science	Program	nme: <b>M</b>	.Tech.						
Semester	I			Course	Catego	ory: PE	*End	I Semester Exam Type: <b>TE</b>				
Course Code	P234	DE102		Peric	ds / W	eek	Credit	Maxii	num Marl	(S		
	1 234			L	Т	Р	С	CAM	ESE	ТМ		
Course Name	Data S	Science	Essentials	3	-	-	3	40	60	100		
Prerequisite	_				<u> </u>	<u> </u>				L		
	On co	ompletio	n of the course, the stude	nts will b	e able	to			BT Ma (Highes	apping at Level)		
Outcomes	CO1	Under	stand the data science proce	ess and n	ow its c	compone			n	.3		
	CO2	Classi	ly, formulate the data scienc	ce problem	is and	manage	large datase	et	K	.3		
	003	Plan n	nodeling, apply basic machin	ne learning	g algori	thms an	d evaluate ti	ne model.	K	.2		
	CO4	CO4 Create effective visualization of data and work with data science projects										
	CO5	Use the science	e data science toolkit and d	evelop aw	arenes	s of eth	ical dimensi	ons of data	K	.3		
UNIT-I	Introd	luction					Periods: 9					
Introduction: Data Science - History and uses of data sc process - Data Scie	Science nd Curre sience ar ence Cla	- Key Fe ent Lands nd big dat assification	atures - Motivations - Relations cape - Data science in a big data a - Facets of data - Data Scienc n - Data Science Applications.	ship betwe a world: Big e Process:	en Artifi 9 Data a A Data	cial Intell nd Data 3 Scientist	igence, Mach Science hype 's Role - Oven	ne Learning - Dataficatior view of the da	, and Data n - Benefits ata science	CO1		
UNIT-II	Data I	Manage	ment				Periods: 9					
Data Exploration: C - Scraping the Web - Dimensionality Re large volumes of da	Objective - Using eduction ata - Dist	<ul> <li>bjectives - Datasets - Descriptive Statistics - Data Visualization – Data Collection: Data Sources - Reading Files</li> <li>Using APIs – Working with Data: Exploring Your Data - Cleaning and Munging - Manipulating Data – Rescaling</li> <li>duction – Data Handling: The problems of handling large data – Techniques and Programming tips for handling</li> <li>a - Distributing data storage and processing with frameworks.</li> </ul>										
UNIT-III	Data I	Data Modeling and Algorithms Periods: 9										
The Modeling Proc Algorithms: Classifi - Logistic Regressio	cess - M ication: k on – Clu	achine le k-Nearest stering: K	arning in Data Science - Over Neighbors - Naïve Bayes - Sup means Clustering – Model Eva	fitting and pport Vecto Iluation: Co	Underfit r Machi nfusion	ting - Co nes– Reg matrix -	rrectness – B gression Meth ROC/AUC- ar	asic Machin ods: Linear F d lift Curves	e Learning Regression	CO3		
UNIT-IV	Data V	Visualiza	ation and Text Analysis				Periods: 9			r		
Define: Data Visual - Data Types - Da Visualization - Boke Classifving Reddit	lization - ata Enco eh (Pytho posts	Data Visi odings - on) – Tex	ualization History - Types of Dat Retinal variables - Mapping v t mining and Text Analytics: Te	ta Visualiza variables to ext mining ir	ition: Ex D Encodent the rea	ploratory dings - V al world -	<ul> <li>Explanatory</li> <li>isual encodir</li> <li>Text mining te</li> </ul>	- Data for Vi igs - Techn chniques - C	sualization ologies for case study:	CO4		
UNIT-V	Data S	Science	Tools and Ethics				Periods: 9					
Data Engineering Tools - Data Visua with R – Next-Ger	: MapRe alization neration	duce, Pre Tools - D Data Scie	egel, and Hadoop – RapidMiner ata Transformation Tools - San antists, Hubris, and Ethics	r: User Inte mpling and	rface an Missing	d Termin Value To	ology - Data I ools - Optimiza	mporting and ation Tools -	d Exporting Integration	CO5		
Lecture Period	s: 30	244 00	Tutorial Periods: 15	Practica	al Perio	ods: -	T	otal Period	s: 45			
Text Books			1				L					
1. Vijay Kot 2. Davy Cie using Pyt 3. Cathy O"	u and B len, Arr thon To Neil and	Bala Des no D. B. ols, Mar d Rache	hpande, Data Science, Cond Meysman and Mohamed Ali ning, 2016. I Schutt, Doing Data Science	cepts and i, Introduc e, Straight	Practic ing Dat Talk fr	ce, Seco a Scient rom The	nd Edition, N ce: Big Data Frontline, O	lorgan Kau , Machine L "Reilly, 201	fmann, 20 .earning, a 3	)19. and more,		
1 Loel Cru	a Nata	Scienco	from Scratch Second Editic	n ∩"P≏il	v 2010	C						
<ol> <li>Skiena, Steven S The Data Science Design Manual. , Springer, 2017.</li> <li>Foster Provost and Tom Fawcett, Data Science for Business: What You Need to Know About Data Mining and Data- Analytic Thinking, 1<sup>st</sup> edition, 2013.</li> <li>John Paul Mueller and Luca Massaron, Python for Data Science for Dummies, 1<sup>st</sup> edition, 2015.</li> <li>Christopher M. Bishop, Pattern Recognition and Machine Learning, 1<sup>st</sup> edition, 2006.</li> </ol>												
			<b>V</b>									
	5-1	~ >	1									

- 1. https://www.ibm.com/topics/data-science
- 2. https://www.oracle.com/in/what-is-data-science/
- 3. https://u-next.com/blogs/data-science/importance-of-data-science/
- 4. https://monkeylearn.com/text-analysis/
- 5. https://www.toptal.com/designers/data-visualization/data-visualization-tools

### \* TE – Theory Exam, LE – Lab Exam

### **COs/POs/PSOs Mapping**

COs		Progra	m Out	Program Specific Outcomes (PSOs)					
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	3	2	-	-	-	1	2	1
2	3	3	3	-	1	-	2	2	1
3	2	3	2	1	2	-	2	2	1
4	3	3	3	1	3	-	2	2	1
5	3	3	3	1	3	-	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ous Asse	essment Marks (	(CAM)	End Semester	Total
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Examination (ESE) Marks	Marks
Marks	10		15	10	5	60	100

5-15/-

Department	Artificial Intelligence and Data Science Programme: M.Tech.									
Semester	I		Course	Catego	ry: PE	*Enc	Semester	Exam Typ	e: TE	
Course Code	P23A	DE103	Peric	ods / We	ek	Credit	Maxi	mum Mark	(S	
	1 207	22100	L	Т	Р	С	CAM	ESE	ТМ	
Course Name	Big D	ata Mining and Analytics	3	-	-	3	40	60	100	
Prerequisite	-									
_	On co	ompletion of the course, the studer	nts will b	e able f	to			BT Ma (Highes	apping st Level)	
Course	CO1	Explore the fundamental concepts	of big da	ta and a	analytic	S.		K	.3	
Outcomes	CO2	To learn Hadoop and develop map	-reduce a	applicat	ions			K3		
	CO3	Design algorithms for handling peta	abytes of	datase	ts			K	2	
	CO4	Design algorithms and propose so consumption	lutions fo	r Big Da	ata by c	ptimizing ma	ain memory	( K3		
	CO5	K	3							
UNIT-I	Introd									
Introduction to Big the practice in ana for Big data Analyti	Data Pla lytics rol ics- Big l	atform – Importance of Big data – Big da e of data scientists - Key roles for succes Data Analytics applications	ita sources ssful analy	s – Acqu tic proje	iisition, E ct - Mair	Big data Busin h phases of life	ess Analytic e cycle - Bes	s - State of st Practices	CO1	
UNIT-II	HADO	DOP				Periods: 9				
History of Hadoop Hadoop Streaming Works-Anatomy of Formats- Map Red	- Hadoo - Desigr a Map luce Fea	aling Out - ap Reduce Types and	CO2							
UNIT-III	Simila									
Nearest Neighbor S Distance Measures	Search – Shingling of Documents – Similarity preserving summaries – Locality sensitive hashing for documents – s – Theory of Locality Sensitive Functions – LSH Families – Methods for High Degree of Similarities									
UNIT-IV	Minin									
Stream Data Mode Moments – Countii	el – San ng Ones	npling Data in the Stream – Filtering Str in Window – Decaying Windows	eams – C	ounting	Distance	e Elements in	a Stream -	Estimating	CO4	
UNIT-V	Predi	ctive Analytics				Periods: 9				
Predictive Analyti Visual data analy	cs- Simp	ble linear regression- Multiple linear regre	ssions - In and applic	terpreta ations	tion of re	gression coef	ficients. Visu	alizations -	CO5	
Lecture Period	s: 30	Tutorial Periods: 15	Practic	al Peric	ods: -	Т	otal Period	ls: 45		
1. Chris Ea Enterpris 2. ure Lesk Edition, 2 3. Jiawei H Edition, 2 <b>Reference Book</b> 1. Ian H.W Publication 2. Arshdee 3. Michael Today's	aton, Di se Class ovec, A 2014. an, Mic 2011. (ss 'itten, E ons, 4 <sup>th</sup> p Bahga Minelli, Busines	rk DeRoos, Tom Deutsch, George Hadoop and Streaming Data", McGa nand Rajaraman, Jeffrey David Ullm cheline amber, Jian Pei, "Data Minir Eibe Frank "Data Mining – Practica Edition, 2016. a, Vijay Madisetti, "Big Data Science Michehe Chambers, "Big Data, Big es", 1 <sup>st</sup> Edition, Ambiga Dhiraj, Wiely (	Lapis, F raw-Hill F an, "Minin ng Conce al Machin & Analytics CIO Serie	Paul Zik Publishir ng of M pts and ne Lea cs: A Ha : Emerges, 2013	topoulo ng, 2012 assive I Techr rning T ands-Or ging Bu 3.	s, "Understa 2. Datasets", C iiques", Morg ools and T n Approach ' siness Intelli	anding Big ambridge L gan Kaufm echniques" ', VPT, 1 <sup>st</sup> E gence and	Data: Ana Jniversity I an Publica , Morgan Edition, 20 Analytic T	alytics for Press, 2 <sup>nd</sup> ations, 3 <sup>rd</sup> Kaufman 18. Frends for	
4. Viktor Ma Think, 1s 5. Tom Wh	ayer-Sc <sup>t</sup> editior ite, Had	hönberger and Kenneth Cukier, Big n, 2013. loop: The Definitive Guide, 4 <sup>th</sup> edition	Data: A	Revolut	ion Tha	at Will Trans	form How \	We Live, V	Vork, and	
	2-1	151-								

- 1. <u>https://encyclopedia.pub/entry/12788#:~:text=Big%20data%20mining%20(BDM)%20is,data%20of%20an%20immense%20volume</u>.
- 2. https://www.techopedia.com/definition/30215/big-data-mining
- 3. https://www.techtarget.com/searchbusinessanalytics/definition/data-mining
- 4. https://www.javatpoint.com/types-of-sources-of-data-in-data-mining-in-dbms
- 5. https://www.ibm.com/topics/predictive-analytics

\* TE – Theory Exam, LE – Lab Exam

### **COs/POs/PSOs Mapping**

COs	I	Progra	m Out	Program Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	3	2	-	-	-	1	2	1
2	3	3	3	-	1	-	2	2	1
3	2	3	2	1	2	-	2	2	1
4	3	3	3	1	3	-	2	2	1
5	3	3	3	1	3	-	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ious Asse	essment Marks	(CAM)	End Semester	Total
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Examination (ESE) Marks	Marks
Marks	1	0	15	10	5	60	100



Department	Artificial Intelligence and Data Science	Program	me: <b>M</b>	.Tech.						
Semester	1	Course (	Catego	ry: PE	*Enc	d Semester	Exam Ty	/pe: <b>TE</b>		
Course Code		Perio	ds / We	ek	Credit	Max	mum Mai	rks		
Course Coue	FZSADE 104	L	Т	Р	С	CAM	ESE	TM		
Course Name	Artificial Intelligence for Decision Making	3	-	-	3	40	60	100		
	-									
Prerequisite	-	<u>.</u>		<u>.</u>		<u></u>				
	On completion of the course, the studer	nts will be	able	to			BT M (Highe	lapping st Level)		
Course	CO1 Understand the concepts of Expert s	ystems.					l	K2		
Outcomes	CO2 Acquire knowledge on Knowledge re	presentat	ion tec	hniques	•		l	K3		
	CO3 Explore the Inference methods.									
	<b>CO4</b> Explore and Analyze the Reasoning	under und	ertaint	y.				K2		
	<b>CO5</b> Demonstrate the design of expert sy	stem						K3		
UNIT-I	Introduction to Expert Systems				Periods: 9					
The meaning of an	expert system - problem domain and knowledge	e domain - I	he adv	antages	of an expert s	system - ger	eral stage	S		
in the development rule-based expert s	t of an expert system - general characteristics of systems - procedural and nonprocedural paradign	an expert ns - charac	system teristics	- history s of artific	and uses of ial neural sys	expert syste tems.	ems today	- CO1		
UNIT-II	IT-II The Representation of Knowledge Periods: 9									
The study of logic - difference between formal logic and informal logic - meaning of Knowledge - how knowledge can be represented - semantic nets - how to translate semantic nets into PROLOG - limitations of semantic nets – schemas - frames and their limitations - how to use logic and set symbols to represent knowledge - the meaning of propositional and first order predicate logic – quantifiers										
- Imitations of propositional and predicate logic.  IINIT-III Methods of Inference Periods: 9										
Trees – lattices - a	ind graphs - state and problem spaces - AND-O	R trees an	d goals	- metho	ds of inference	ce - rules of	inference	-		
limitations of propor reasoning - applyin knowledge - the Ma Intelligence in Intell	sitional logic - logic systems - resolution rule of info g resolution to first-order predicate logic - forward Irkov decision process – Decision Making – Decisi ligent Decision Support System.	erence - res and backw on Making	solution ard cha using M	systems aining - ao IL, Decisi	- and deducti dditional meth on Support S	on - shallow ods of Infer ystem – Role	and causa ence - Meta e of Artificia	a CO3 a al		
UNIT-IV	Reasoning Under Uncertainty				Periods: 9					
The meaning of ur induction - features hypothetical reason role of uncertainty in are propagated.	ncertainty and theories devised to deal with it - to s of classical probability - experimental and sub ning and backward induction - temporal reasonin n inference chains - implications of combining evid	ypes of ern jective pro ng - Markov lence - role	ors attri babilitie chains of infere	ibuted to s - comp s - odds o ence nets	uncertainty - bound and co of belief - suff s in expert sys	errors asso onditional pro ficiency and tems - how p	ociate - wit obabilities necessity probabilitie	h <b>CO4</b> - - s		
UNIT-V	Design of Expert Systems				Periods: 9					
How to select an development stag system - how to d	appropriate problem - the stages in the developes - the role of the knowledge engineer in the boa life cycle model.	opment of e	an expe expert s	ert syste systems -	m - types of the expected	errors to ex d life cycle c	pect in the	e rt CO5		
Lecture Period	s: 30 Tutorial Periods: 15	Practica	l Peric	ods: -	T	otal Period	ds: 45			
Text Books										
1. Durkin, J., "E	xpert systems Design and Development", M	acmillan, <sup>-</sup>	1994.							
2. Elias M. Awa	d, "Building Expert Systems", West Publishir	ng Compa	ny, 19	96.						
3. Peter Jackso	n, "Introduction to Expert Systems", Addison	n Wesley L	.ongma	an, 1999	).					
Rafaranca Rock	e									
1. Gonzalez and	J. Dankel. "The Engineering of Knowledge	e-Based S	vstems	s". Prent	tice Hall. 199	94.				
<ol> <li>Nikolopoulos</li> <li>H. B. Verbru</li> </ol>	, "Expert Systems", Marcel Dekker Inc. 1997 Iggen, Spyros G. Tzafestas, "Artificial Inte	Iligence ir	n Indu	strial De	ecision Mak	ing, Contro	ol and Au	utomation",		
Springer, 201 4. Lakhmi C. Ja	l2. ain, Gloria Phillips-Wren, "Intelligent Decisio	n Support	: Syste	ems in A	gent-medial	ted Enviror	nments", I	OS Press,		
2005. 5. Nilanjan Dey	Jitendra Kumar Rout, Himansu Das, Suresh	Chandra	Mohara	ana "Apj	olied Intellige	ent Decisio	n Making	in Machine		
Learning", Cl	KC Press; 1 <sup>st</sup> Edition, 2020.									

5. ASL-

- 1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2010/lecture-videos/lecture-3-reasoning-goal-trees-and-rule-based-expert-systems/
- 2. http://www.umsl.edu/~joshik/msis480/chapt11.htm
- 3. https://www.coursera.org/courses?query=decision%20making
- 4. https://www.slideshare.net/akhilrocker143/572-11293384
- 5. https://www.sciencedirect.com/science/article/abs/pii/0378720693900696

### \* TE – Theory Exam, LE – Lab Exam

### **COs/POs/PSOs Mapping**

COs		Progra	m Out	Program Specific Outcomes (PSOs)					
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	3	2	-	-	-	1	2	1
2	3	3	3	-	1	-	2	2	1
3	2	3	2	1	2	-	2	2	1
4	3	3	3	1	3	-	2	2	1
5	3	3	3	1	3	-	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ious Asse	essment Marks	(CAM)	End Semester	Total
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Examination (ESE) Marks	Marks
Marks	10		15	10	5	60	100

Department	Artific	cial Intelligence and Data Science	Program	nme: M	Tech.					
Semester	11		Course	Catego	ry: <b>PC</b>	*End	d Semester	Exam Typ	be: TE	
Course Code	DJJA	07204	Perio	ds / We	ek	Credit	Maxi	num Mar	ks	
Course Code	FZJA	D1204	L	Т	Р	С	CAM	ESE	TM	
Course Name	loT ar	nd Edge Computing	3	-	-	3	40	60	100	
Prerequisite	-		.[	<u>i</u>	L				.L	
	On co	ompletion of the course, the stude	nts will be	e able t	to			BT Ma (Highes)	apping st Level)	
Course	CO1	Interpret the vision of IoT from a g	lobal cont	ext alor	ng with	the uses of I	OT devices.	k	(2	
Outcomes	CO2	Determine the Market perspective	of IoT.					r	K2	
	CO3	Design a portable IOT using Raspl	berry Pi					k	(3	
	CO4	Describe the importance of edge c	omputing					4	(2	
	CO5	Illustrate the applications in Indust Constraints	rial Auton	nation a	and ide	ntify Real W	orld Design	ķ	(2	
UNIT – I	Introd	uction and Enabling Technologies				Periods:9		<u>i</u>		
Definition and C	Characte	ristics - Physical Design - Things in	n loT- Pr	otocols.	Logica	I Desian -C	ommunicatio	n Models	-	
Communication A - Software Defined Systems Managen	APIs - Dif d Netwo nent - Ne	ference between IoT and M2M - SDN ar rking - Network Function Virtualization etwork Operator Requirements – NETCO	nd NFV for - System NF - YAN(	IoT Manage G.	ement w	ith NETCON	F-YANG - Ne	ed for Io	<b>CO1</b>	
UNIT – II	loT Pr	otocols				Periods:9				
IoT Access Technologies: Physical and MAC layers - topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN — Network Layer: IP versions, Constrained Nodes and Constrained Networks — Optimizing IP for IoT - From 6LoWPAN to 6Lo - Routing over Low Power andLossy Networks — Application Transport Methods- Supervisory Control and Data Acquisition — Application Layer Protocols: CoAP and MQTT										
		atforms Docian Mothodology	,			Poriode:0				
IoT Physical Devi	IUI PI	Endpoints — Introduction to Raspherry	v PI - Inter	faces (S	Serial S	PERIOUS:9	ramming – P	vthon		
program with Rasp	berry PI	with focus of interfacing external gadgets	s - Controll	ling outp	out -Rea	ding input fro	om pins		CO3	
UNIT – IV	Introd	uction to Edge Computing				Periods:9				
Fog computing vs Edge Cloud Archite Integration - Secur	Edge col ectures - ity Mana	mputing - Need for edge computing - ber Clusters for Lightweight Edge Clouds - A gement for Edge Cloud Architectures.	efits of Ed	ge comp e Manag	outing. L gement -	ightweight Co – Storage an	ntainer Midd d Orchestrati	eware for on - IoT	CO4	
UNIT – V	Physic	cal Servers and Cloud Offerings				Periods:9				
Physical Servers server for IoT - C	and Clou Cloud for	ud Offerings – Introduction to Cloud Stora IoT - Python web application framewo	age models rk - Desigr	s and co ning a R	mmunic RESTful	ation APIs W web API.	eb Server —	Web	CO5	
LecturePeriod	s:45	TutorialPeriods:0	Practica	alPerio	ds:-0	L	ecturePeri	ods:45		
Textbooks			<u>l</u>			i.				
1. Vijay Ma	disetti a	and Arshdeep Bahga, "Internet of Th	nings: A H	lands-o	n Appr	oach", VPT,	First editior	າ,2014.		
2. Olivier H Wiley, S	lersent, econd l	David Boswarthick, Omar Elloumi, Edition, 2012.	"The Inte	ernet of	Things	s — Key apj	plications a	ndProtoc	ols",	
3. Rajkuma First Edit	r Buyya tion, 20 <sup>-</sup>	a, Satish Narayana Srirama "Fog an 19.	nd Edge (	Comput	ing: Pri	nciples and	Paradigms	",Wiley-B	ackwell,	
4. Arshdee	p Bahga	a and Vijay Madisetti, "Internet of Thi	ings – A F	lands-c	on Appr	oach", Unive	ersities Pres	s,2015		
5. Matt Ricl	hardson	& Shawn Wallace, "Getting Started	with Rasp	berry F	°i", O'Re	eilly (SPD),	Third Edition	,2016		
	2-1	N 3 /								

Refere	nces
1.	Jonathan Follett, "Designing for Emerging - UX for Genomics, Robotics, and the Internet of Things Technologies", O'Reilly, First Edition, 2014.
2.	Charalampos Doukas, "Building Internet of Things with the Arduino", Create space Publishers, 2012
3.	Donald Norris, "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi andBeagle Bone Black", Mc.Graw Hill, First Edition, 2015.
4.	Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, "From Machine- to-Machine to the Internet of Thing — Introduction to a New Age of Intelligence", Elsevier, 2014.
5.	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
Web R	eferences
1.	https://www.wired.co.uk/article/internet-of-things-what-is-explained-iot
2.	https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/
3.	https://www.geeksforgeeks.org/edge-computing/
4.	https://www.i-scoop.eu/internet-of-things-guide/edge-computing-iot/

# COs/POs/PSOs Mapping

COs	l	Progra	m Out	Program Specific Outcomes (PSOs)					
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	3	2	-	-	-	1	2	1
2	3	3	3	-	1	-	2	2	1
3	2	3	2	1	2	-	2	2	1
4	3	3	3	1	3	I	2	2	1
5	3	3	3	1	3	I	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ous Asse	essment Marks	(CAM)	End Semester	Total
	CAT 1	CAT 2	Model Exam	Assignment*	Examination (ESE) Marks	Marks	
Marks	1	0	15	10	5	60	100

Department	Artifi	cial Intelligence and Data Science	Progran	nme: <b>M</b>	.Tech.				
Semester	II		Course	Catego	ory: PC	*Enc	d Semester	Exam Typ	be: TE
Course Code	D22 A	DT205	Peric	ds / W	eek	Credit	Maxir	num Mar	ks
Course Coue	FZJA	D1203	L	Т	Р	С	CAM	ESE	TM
Course Name	Natur	al Language Processing	3	-	-	3	40	60	100
Prerequisite	Mach	ine Learning							-
	On co	ompletion of the course, the studer	nts will b	e able	to			BT M (Highes	apping st Level)
Course	CO1	Understand the basics of NLP						r	(3
Outcomes	CO2	Apply the basic ML and DL technic	ques for N	LP				K2	, K3
	CO3	Understand and realize the advance	ced NLP	Technic	ques.			ł	(2
	CO4	Understand the concept of NLU Retrieval	, NLG a	nd app	ly the	concept of	Information	K2	,K3
	CO5	Apply ethics to be followed while the Libraries	ouilding N	ILP Ap	plicatior	ns and how	to use NLP	ł	(3
UNIT – I	Introd	duction				Periods:9			
Phases of NLP, Text Preprocessing: Tokenization, Stemming and Lemmatization, Pos Tagging, Named Entity Recognition. NLP Feature Engineering, Word Count Vector, Word Sense Disambiguation									C01
UNIT – II	Lang	uage Modelling				Periods:9			<u>.</u>
N -gram Models, H	lidden Ma	arkov Models, Maximum Likelihood Estimation	ation. Supe	ervised,	Unsupe	rvised and Sei	mi Supervised	Learning	CO2
NLP.			lustening, v		πρεσσιιή			, CININ IOI	
UNIT – III	Adva	nced NLP Techniques				Periods:9			
Sequence- to -Sec	quence N	Iodels, Attention Mechanisms, Transform	er Archite	cture: B	ERT, GF	Ϋ́Τ			CO3
UNIT – IV	Lang Retrie	uage Understanding and Generatic	on, Inforn	nation		Periods:9			
Text Generation, C Indexing and Sear	Question ch, Text	Answering, Dialogue Systems and Chatb Summarization.	oots. Machi	ne Tran	slation, (	Cross Lingual	Transfer Lea	rning. Tex	CO4
UNIT – V	NLP 1	Tools, Libraries, Applications, Ethic	CS			Periods:9			
Bias and Fairnes Applications: Sent	s in NLF iment An	P, Privacy Concerns in NLP Application alysis, Named Entity Recognition in Real	ns. NP lik World Da	raries: a Sets,	NLTK, Text Cla	Spacy, Tens	or Flow, Pyt Various Dom	orch. NLF nains.	CO5
LecturePeriod	s:45	TutorialPeriods:0	Practic	alPerio	ds:-0	L	ecturePerio	ods:45	<u> </u>
Textbooks			1			L			
1. Vijay Ma	adisetti a	and Arshdeep Bahga, "Internet of Th	nings: A H	lands-c	on Appr	oach", VPT,	1 <sup>st</sup> edition,	2014.	
2. James A	llen, "N	atural Language Understanding", 2 <sup>nd</sup>	Edition, F	Pearsor	n Educa	tion, 2003.			
3. Jurafsky	, Dan ai	nd Martin, James, "Speech and Lang	uage Pro	cessing	g", 2 <sup>nd</sup> E	Edition, Pren	tice Hall, 20	08.	
4. Srini Jar	narthana	am, "Hands-On Chatbots and Conver	sational L	II Deve	lopmen	t: Build chat	bots", Publis	hed by P	acket
Publishi	ng Ltd., bardsor	1 <sup>st</sup> Edition, 2017.	with Rasr	horry F		ailly (SPD)	Chird Edition	2016	
	narusor	r & Shawn Wallace, Getting Started	with itasp		1,010	eiliy (3Γ <i>D)</i> ,		,2010	

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Refere	nces
1.	Cathy Pearl, "Designing Voice User Interfaces: Principles of Conversational Experiences", Shroff/O'Reilly, 1 <sup>st</sup> Edition, 2017
2.	Daniel M.Bikel and Imed Zitouni, "Multilingual Natural Language Processing Applications: From Theory To Practice", Pearson Publications, 2019
3.	Abhishek Singh, Karthik Ramasubramanian, Shrey Shivam, "Building an Enterprise Chatbot: Work with Protected Enterprise Data using Open Source Frameworks", Apress, 2019.
4.	Michael McTear, Zoraida Callejas, David Griol, "The Conversational Interface: Talking to Smart Devices", Springer, First Edition 2016.
5.	Akshar Bharathi, Vineet chaitanya, "Natural Language Processing, A paninian perspective", Prentice – Hall of India,2018
Web R	eferences
1.	https://www.udemy.com/course/chatbot/
2.	https://gtuematerial.in/natural-language-processing-3170723/
3.	https://chatbotsmagazine.com/understanding-the-need-for-nlp-in-your-chatbot-78ef2651de84?gi=ecca664b642a
4.	https://www.ultimate.ai/blog/ai-automation/how-nlp-text-based-chatbots-work

## COs/POs/PSOs Mapping

COs		Progra	m Out	Program Specific Outcomes (PSOs)					
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	3	2	-	-	-	1	2	1
2	3	3	3	-	1	-	2	2	1
3	2	3	2	1	2	-	2	2	1
4	3	3	3	1	3	-	2	2	1
5	3	3	3	1	3	-	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ious Asse	essment Marks (	(CAM)	End Semester	Total
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Examination (ESE) Marks	Marks
Marks	10		15	10	5	60	100

Department	Artific	cial Intelligence and Data Science	Program	nme: M	l.Tech.			,				
Semester	II		Course	Catego	ory: <b>PC</b>	*Enc	l Semeste	r Exam Typ	e: <b>TE</b>			
Course Code	P23A	DT206	Peric	ods / W	eek	Credit	Ma	kimum Mark	ເຮ			
	0/ (		L	T	Р	С	CAM	ESE	TM			
Course Name	Adva	nced Deep Learning	3	-	-	3	40	60	100			
	_											
Prerequisite	Machi	ine Learning										
	On co	ompletion of the course, the stude	nts will b	e able	to			BT Ma	apping			
Course	CO1	Inderstand basic neural network	activation	functio	n and lo	ss functions		(Hignes	t Level)			
Outcomes				Nut			•		2			
	CO2	Able to apply different Convolution		Netwo	rk.			ĸ	2			
	CO3	Understand different deep learning	Jun ueen leant		ization met	nods.	K	2				
	CO4	Understand different Neural Netwo	ork Model					K	2			
	CO5	Understand Neural Style transfer a	nd autoer	ncoding	process			K	2			
UNIT – I	Found	dations Of Neural Networks				Periods:9		-1. N				
Backpropagation L	earning	- Activation Functions: Linear – Sigmoid -	– Tanh - Ha	ard Tanl	ward Net h – Softma	ax -Rectified I	Linear - Los	as Functions:	CO1			
Loss Function Not	ation - L	oss Functions for Regression - Loss Fu	unctions for	r Classi	fication -	Loss Functio	ns for Rec	onstruction -				
Hyperparameters:	Learning	g Rate – Momentum – Sparsity -Understa	anding Con	volutior	ns.	Poriode:0						
CNN Building Bloc	ks: Lave	r Type - Convolutional Laver - Activation	Laver - Po	olina La	aver - Full	v Connected	Laver -Bat	ch	CO2			
Normalization – Dr	opout - (	opout - Common architecture and Training Pattern - LeNet-5 - AlexNet - VGG16 net - ResNet.										
UNIT – III	Optin	nization				Periods:9						
Regularization - D	ropout F	Regularization - Normalizing Inputs- Van	nishing / Ex	ploding	Gradient	s - Weight In	nitialization	- Numerical				
Approximation of C	Gradients	6 - Gradient Checking. Mini-batch Gradie	nt Descent	: - Expo	nentially V	Veighted Ave	erages - Bia	IS Correction	CO3			
Problem of Local C	optima -	Transfer learning and Fine tuning.	ntum - Adai	n Opun	IIZALION AI	gontnin - Lea	ining Rate	Decay - The				
UNIT – IV	RNN					Periods:9						
Building and impro	ving Fee	ed Forward Language Model - RNN - Bid	irectional F	RNN – L	.STM – GI	RU - Seq2Se	q paradigm	1 -	CO4			
mululength Seq25	eq.											
UNIT – V	Deep	Reinforcement Learning				Periods:9						
Value iteration - C autoencoding - co	2 Learnii onvolutio	ng - Basic deep Q Learning - Policy grad nal autoencoding - variational autoencod	ient metho ding - Gene	d - acto erative A	r critic me Adversaria	thod - Experi I Network (G	ence repla AN).	y - Basic	CO5			
LecturePeriod	s:45	TutorialPeriods:0	Practica	alPeric	ods:-0	L	ecturePe	riods:45				
Textbooks												
1. Eugene	Charnia	k, "Introduction to Deep Learning", N	/IT Press,	2019.								
2. Ian Good	dfellow,	Yoshua Bengio, Aaron Courville, "De	eep Learn	ing", M	IIT Press	, 1st Edition	, 2016					
3. Charu C	. Aggan	wal, "Neural Networks and Deep Lea	arning", Sp	oringer,	2018							
References		National Data Analysis from		t ·	Deint of	liour" Com	bridge Ile					
2015.	comina c	shalizi, Advanced Data Analysis Iron	n an Elem	entary	Point of	view, cam	bridge On	versity Pres	55,			
2. Deng & `	Yu, "De	ep Learning: Methods and Applicatio	ns", Now	Publisł	ners, 201	4						
3. Michael	Nielsen	, "Neural Networks and Deep Learnir	ng", Deter	minatio	on Press,	2015.						
Josh Patterson, A	Adam G	ibson, "Deep Learning A Practitione	r's Approa	ich", O	'Reilly Me	edia, 2017.						
4. Nikhil Bu	duma, ʻ	'Fundamentals of Deep Learning", O	?Reilly, 20	)17.								
Web Reference	5											
1. https://np	otel.ac.ii	n/courses/106/106/106106184/										
2. http://deo	eplearni	ng.net/Dj										
3. https://w	ww.guru	use.com/deep-learning-tutorial.html	20									
4. https://W	ww.cou	vorksanddeenlearning.com/	iig									
5. http://nei	Janet	ขากรลานนะยุทยสกาแก่ง.com/										

5-15/-
## \* TE – Theory Exam, LE – Lab Exam

## COs/POs/PSOs Mapping

COs		Progra	m Out	comes	s (POs)		Program Specific Outcomes (PSOs)			
	PO1 PO2 PO3 PO4 PO5 PO6							PSO2	PSO3	
1	2	3	2	-	-	-	1	2	1	
2	3	3	3	-	1	-	2	2	1	
3	2	3	2	1	2	-	2	2	1	
4	3	3	3	1	3	-	2	2	1	
5	3	3	3	1	3	-	2	2	1	

# Correlation Level: 1 - Low, 2 - Medium, 3 – High

Assessment		Continu	ious Asse	essment Marks	(CAM)	End Semester	Total
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Examination (ESE) Marks	Marks
Marks	1	0	15	10	5	60	100



Department	Artific	ial Intelligence and Data Science	Program	nme: <b>M</b>	.Tech.				
Semester	11		Course	Catego	ry: PC	*End	Semester	Exam Typ	e: <b>TE</b>
Course Code	D33 VI	07207	Perio	ds / We	eek	Credit	Maxii	num Mark	S
	1 234	51201	L	Т	Р	С	CAM	ESE	TM
Course Name	Al and	d Robotic Process Automation	3	-	-	3	40	60	100
i									
Prerequisite	-			L	1	1			
	On co	mpletion of the course, the studer	nts will be	e able t	to			BT Ma (Highes	apping t Level)
Course	CO1	Describe RPA, where it can be app	lied and	now it's	implen	nented.		K	3
Outcomes	CO2	Describe the Different Types of V	/ariables,	Contro	ol Flow	and Data Ma	anipulation	K2,	K3
		Techniques							
	CO3	Identify and understand Image, Tex	xt and Da	ta Tabl	es Auto	mation.		K	2
	CO4	Describe how to handle the User strategies.	Events	and va	rious ty	pes of Excer	otions and	K2,	K3
	CO5	Understand the Deployment of the	Robot a	nd to m	aintain	the connectio	n.	K	3
UNIT – I	Introd	luction to Robotic Process Automa	ation			Periods:9			
What is RPA - RP Standardization of business case - R Challenges with RF	A vs Au processo PA Tear PA - RPA	utomation - Processes & Flowcharts - F es - RPA Development methodologies - m - Process Design Document/Solution A and emerging ecosystem.	Programmi Difference Design D	ng Con from SI ocumen	structs i DLC - R it - Indu	n RPA - RPA obotic control fl stries best suit	Advanced ( ow architec ed for RPA	Concepts - ture - RPA - Risks &	C01
UNIT – II	RPA 1	Fool Introduction and Basics				Periods:9			
Introduction to RPA Flow - Control Flow The While Activity - variables, collection	Tool - To	The User Interface - Variables - Control F es - The Assign Activity - The Delay Activ Each Activity - The Break Activity - Data ables - Text Manipulation - Data Manipul	ity - If Els ity - The D Manipulat	e State o While ion- Dat	ments - Activity ta Manip	Loops - Flowch - The If Activity ulation Introduc	arts - About -The Switch ction - Scala	Control Activity - r	CO2
UNIT – III	Advar	nced Automation Concepts & Tech	niques	incring t		Periods:9			
Recording Introduc Data Scraping - Sc Dynamic Selectors Automation - Excel Extracting Data from	tion - Ba raping a - Partial Data Ta n PDF	sic and Desktop Recording - Web Recordvanced techniques - Selectors - Defining Selectors - RPA Challenge - Image, Tex ables & PDF - Data Tables in RPA - Exce	ding - Inpu g and Asse t & Advane I and Data	it/Outpu essing S ced Citri Table b	t Method Selectors ix Autom basics - I	ds - Screen Scr - Customizatic nation Introducti Data Manipulati	aping - on -Debuggi on to Image on in excel	ng - e & Text -	CO3
UNIT – IV	Hand	ing User Events & Assistant Bots,	Exception	on Han	dling	Periods:9			
What are assistant element triggers - A bot on a keyboard e	bots - M An exam event. D	Ionitoring system event triggers - Hotkey ple of monitoring email - Example of mor ebugging and Exception Handling - Debu	r trigger - N hitoring a c ugging Too	Nouse ti opying e Is - Stra	rigger - S event an ategies fo	System trigger - Id blocking it - L or solving issue	-Monitoring .aunching a s - Catching	image and n assistant i errors.	CO4
UNIT – V	Deplo	ying and Maintaining the Bot				Periods:9			
Publishing using pu Connecting a Robo packages - Deleting	iblish uti ot to Ser g packag	ility - Creation of Server - Using Server to ver - Deploy the Robot to Server - Publis ges	o control th shing and	e bots - managi	Creatin ng upda	g a provision R tes -Managing	obot from th packages -	e Server - Uploading	CO5
LecturePeriods	:45	TutorialPeriods:0	Practica	alPerio	ds:-0	Le	cturePerio	ods:45	
Textbooks									
1. Tom Tau	lli, The	Robotic Process Automation Handbo	ook: A Gu	ide to I	mpleme	enting RPA Sy	vstems, 202	20.	
2. Alok Man	i Tripat	hi, "Learning Robotic Process Autom	ation", Pa	ickt Pu	blishing	, 2018.			
Reference Book	S								
1. Frank Ca	sale, R	ebecca Dilla, Heidi Jaynes, Lauren L	ivingston,	"Introc	luction	to Robotic Pro	ocess Auto	mation:	
3. Richard N	, Institu /lurdocł	n, Robotic Process Automation, 1s	e to Buildi	2015. ng Soft	ware Ro	obots, Automa	ite Repetiti	ve Tasks a	& become
an KPA (		ani, independentiy Published, 1st Ec	allion 201	ö.	mation	and their her	ofite: Llado	retanding	DDA and
Intelligen	t Autom	nation", Consulting Opportunity Holdir	ngs LLC,	1st Edi	tion 201	18.	ente. Unde	stantunity	
5. 4. Lin automate	n Mei ` busine	Ying, "Robotic Process Automation ess processes", Packt Publishing, 1st	with Blue Edition 2	e Prism 018.	n Quick	Start Guide:	Create so	oftware ro	bots and
<u></u>									

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Web	R	eferences
	1.	https://www.uipath.com/rpa/robotic-process-automation
	2.	https://www.academy.uipath.com
	3.	https://www.guru99.com/deep-learning-tutorial.html
	4.	https://www.coursera.org/specializations/deep-learning
	5.	http://neuralnetworksanddeeplearning.com/

# \* TE – Theory Exam, LE – Lab Exam

### COs/POs/PSOs Mapping

COs		Progra	m Out	comes	s (POs)	)	Program Specific Outcomes (PSOs)			
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	
1	2	3	2	-	-	-	1	2	1	
2	3	3	3	-	1	-	2	2	1	
3	2	3	2	1	2	-	2	2	1	
4	3	3	3	1	3	-	2	2	1	
5	3	3	3	1	3	-	2	2	1	

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ous Asse	essment Marks (	(CAM)	End Semester	Total
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Examination (ESE) Marks	Marks
Marks	10		15	10	5	60	100

Department	Artificial Intelligence and Data Science	Prog	ramme: <b>M.</b>	Tech.								
Semester	II	Cour	se Catego	ory Coc	le: <b>PC</b> *E	End Semes	ter Exam	Гуре: <b>LE</b>				
Course Code	P23ADP202     Periods / Week     Credit     Maximum Marks       L     T     P     C     CAM     ESE     -											
		L	Т	P	С	CAM	ESE	TM				
Course Name	Deep Learning Laboratory	0	0	4	2	50	50	100				
Prerequisite	NIL						•					
	On completion of the course, the stude	nts wil	l be able	to			BT Map (Highes	ping t Level)				
Course	CO1 Understand the role of neural netwo	rks in e	ngineerin	g & art	ificial intellig	jence.	K2					
S	CO2 Understand regularization methods	for grad	dient prob	lem.			K2					
	CO3 Apply various optimization technique	es and	fine-tuning	g proce	ess.		K3					
	CO4 Understand various Neural Network	model	s.				K3					
	CO5 Apply deep learning Network in vario	ous app	olications.				K3					
	List of Exercises											
<ol> <li>Build a d</li> </ol>	leep learning model to product Sales using LST leep learning model to predict Movie box office us leep learning model to predict Sports result Predi leep learning model to predict Cardiovascular Dis leep learning model to create an art using Style T leep learning model to a identify traffic signs from leep learning model for Fashion Recommendatio	M sing GR ction us cease us ransfer the ima n Syste	U model ing RNN ar sing ANN technique age m	nd LST	M							
Lecture Period	s: Tutorial Periods:	Prac	tical Perio	ods: 3	0	Total Peri	ods: 30	l				
Reference Boo	ks											
<ol> <li>Cosma 2015.</li> <li>Deng &amp;</li> <li>Michael</li> <li>Josh Pa</li> <li>Nikhil B</li> </ol>	Rohilla Shalizi, "Advanced Data Analysis fr Yu, "Deep Learning: Methods and Applicati Nielsen, "Neural Networks and Deep Learn atterson, Adam Gibson, "Deep Learning A Pr uduma, "Fundamentals of Deep Learning", (	rom an ons", N ing", D ractitior D'Reilly	Elementa low Publis eterminati her's Appr v, 2017.	ary Poi hers, 2 on Pre oach",	nt of View", 2014. ss, 2015. O'Reilly Me	Cambridge dia, 2017.	e Universit	y Press,				
Web Reference	9S											
<ol> <li>https://n</li> <li>https://w</li> <li>https://w</li> </ol>	ptel.ac.in/courses/106/106/106106212/ www.geeksforgeeks.org/data-analysis-visual www.coursera.org/learn/python-data-analysis	ization.	-python/									

- 4. https://www.python.org/
- 5. https://www.programiz.com/python-programming
  - \* TE Theory Exam, LE Lab Exam

COs		Progra	m Out	comes	s (POs)	)	Program Specific Outcomes (PSOs)			
	P01	PO2	PO3	PSO1	PSO2	PSO3				
1	3	3	3	3	2	3	3	3	2	
2	3	2	2	2	1	2	2	2	1	
3	3	1	1	1	2	1	1	1	2	
4	3	1	1	2	2	1	2	1	2	
5	3	2	2	2	3	2	2	2	3	

Correlation Level: 1 - Low, 2 - Medium, 3 - High

5-15/--

	Co						
Assessment	Performan cla	ce in pract asses	ical	Model		End Semester	Total
	Conduction of practical	Record work	viva	Practical Examination	Attendance	Examination (ESE) Marks	Marks
Marks	15	5	5	15	10	50	100

Department	Artific	cial Intelligence and Data Science	telligence and Data Science Programme: M.Tech.										
Semester	II		Course	Catego	ry : <b>HS</b>	*En LE	*End Semester Exam Type: LE						
			Peric	ods / We	ek	Credit	Credit Maxi		timum Marks				
Course Code P23HSPC02			L	Т	Р	С	CAM	ESE	TM				
Course Name	Semii Appro	nar On ICT: A Hands-On bach	-	-	4	2	100	-	100				
(Cor	(Common to all M.Tech Programmes)												
Prerequisite	No Pr	erequisite needed											
	On co	ompletion of the course, the stude	nts will b	e able t	0			BT Ma (Highes	apping st Level)				
Course	CO1	Select a topic, narrowing the topic i	K	(2									
S Outcome	CO2	State an objective and use the relevent offective.	vant ICT	tools to	make th	e presentat	ion	K	(3				
CO3Study the topic and understanding the contributions and prepare report.H									(2				
	CO4	Prepare a working demo. K3											
	CO5	Prepare conclusions based on the reading of the topic and giving final Presentation.											

#### List of Experiments:

The methodology used is "learning by doing", a hands-on approach, enabling the students to follow their own pace. The teacher, after explaining the project, became a tutor, answering questions and helping students on their learning experience.

#### **ICT skills**

- Understand ICT workflow in the respective domain choosed.
- Manage multitasking.
- Deal with main issues using tech in class.
- Record, edit and deliver audio and video.
- Automate assessments and results.

#### Scope

- Perspective in order to design activities in class.
- Understand the process of creating audiovisuals.

#### **Teaching tools**

- Different ways to create audiovisual activities.
- Handle audiovisual editors.
- Collaborative working.
- Individualize learning experience.
- Get instant feedback from students.

Each one of the students will be assigned an ICT Topic and the student has to conduct a detailed study on the assigned topic and prepare a report, running to 30 or 40 pages for which a demo to be performed followed by a brief question and answer session. The demo will be evaluated by the internal assessment committee (comprising of the Head of the Department and two faculty members) for a total of 100 marks.

Lecture Periods: -	Tutorial Periods: -	Practical Periods: 45	Total Periods: 45
* TE – Theory Exam, LE	– Lab Exam		



COs		Progra	m Out	comes	s (POs)	)	Program Specific Outcomes (PSOs)			
	P01	PO2	PO3	PSO1	PSO2	PSO3				
1	-	3	1	1	3	3	3	2	1	
2	-	3	1	1	3	2	3	2	1	
3	-	3	1	1	3	2	3	2	1	
4	-	3	1	1	3	2	3	2	1	
5	-	3	1	1	3	2	3	2	1	

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment	Co					
	Perform	nance in practical		End Semester	Total	
	Presention using ICT	Report	viva	Attendance	Examination (ESE) Marks	Marks
Marks	30	30	10	-	100	

Department	Artificial Intelligence and Data Science	Programme: M.Tech.							
Semester	II	Course Category Code: <b>AEC</b> *End Semester Exam Type:						Гуре: -	
Course Code		Perio	ds / We	ek	Credit	Ma	ximum Ma	arks	
		L	Т	Р	С	CAM	ES	ТМ	
							E		
Course Name	Ability Enhancement Courses	-	-	4	-	100	-	100	
	.4				•				
			4	<u>.</u>	±	±	4		

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

Department	Computer Science Engineering (Big Data Analytics)	Prograr	nme: <b>M.</b> 1	Fech.				
Semester	l	Course	Categor	y : <b>PE</b>	End Ser	nester E>	am Type:	TE
Course Code	P23BDEC02	Pe	riods / W	/eek	Credit	N	laximum I	Marks
		L	Т	Р	С	CAM	ESE	ТМ
Course Name	Web Analytics and Development	3	-	-	3	40	60	100
	(Common to M.Tec	h CSE(BDA	) and Al	and DS)	)			L
Prerequisite	Internet Programming						<b>,</b>	
	On completion of the course, the stud	ents will be	able to				BT Ma (Highes	pping t Level)
Course	<b>CO2</b> Use the various Data Streams Data.	rm, and their					ĸ	ა ვ
Outcomes	CO3 Know how the survey of capturing of	data will ben	efit.				К	2
	<b>CO4</b> Understand Common metrics of web	as well as KF	Pl related	concepts	•		K	3
	<b>CO5</b> Apply various Web analytics versions	s in existence					K	3
UNIT – I	Introduction				Periods:9		.1	
Definition, Proce Content character evolution, Need UNIT – II	ess, Key terms: Site references, Keywords and erization terms, Conversion metrics; Categories for web analytics, Advantages, Limitations Data Collection	d Key phrases s: Offsite web	s; building , on site w	) block ter veb; Web a	ms: Visit cha analytics pla <b>Periods:9</b>	aracterizat tform, Wel	ion terms, o analytics	CO1
Click stream Da Brand/Advocacy measurement, I	ta: Web logs, Web Beacons, JavaScript tags, / and Support; Research data: Mindset, Organ SP-based measurement, Search Engine data.	Packet Sniffin	ng; Outco cture, Tim	mes Data ning; Com	: Ecommerco petitive Data	e, Lead g a: Panel-B	eneration, ased	CO2
UNIT – III	Qualitative Analysis			I	Periods:9			
Benefits of site v data: Web logs selecting optima Link coding issu	visits; Surveys: Website surveys, post-visit surv or JavaScript's tags, Separate data serving a al web analytic tool, Understanding click strea es. Web Metrics	veys, creating and data capt im data qualit	and runni ure, Type y, identify	ing a surv and size ring uniqu	ey, Benefits e of data, Inr le page defin Periods:9	of surveys novation, I nition, Usi	s. Capturing ntegration, ng cookies	, <b>CO3</b>
Common metric on site, new v campaigns; Rea Introduction to k Client / Server C UNIT – V	s: Hits, Page views, Visits, Unique visitors, Ur isits; Optimization (e-commerce, non-e- cor al time report, Audience report, Traffic source r KPI, characteristics, Need for KPI, Perspective Computing, HTTP (Hypertext Transfer Protocol Web Analytics 2.0	nique page vi mmerce sites report, Custor e of KPI, Use I), Server Log	ews, Bour ): Improv n campai s of KPI. Files & C	nce, Bour ving boun gns, Cont Relevant Cookies, V	nce rate, Pa nce rates, C ent report, C Technologie Veb Bugs. <b>Periods:9</b>	ge/visit, Av Optimizing Google ana es: Interne	verage time Ad Words alytics, t & TCP/IP	, <b>CO4</b>
Web analytics 1.0 Toolbar data, Par Analyzing compe Categories of traf concerns, Privacy	b, Limitations of web analytics 1.0, Introduction nel data, ISP data, Search engine data, Hybric titive site overlap and opportunities. Google Ar fic: Organic traffic, Paid traffic; Google website / issues.	n to analytic 2 d data, Websi nalytics: Brie e optimizer, li	0, Compete traffic a introduction plement	etitive inte analysis: ( on and wo ation tech	elligence ana Comparing k orking, Ad W nnology, Lim	lysis: CI d ong term t 'ords, Ber itations, P	ata source raffic trends nchmarking erformance	s CO5
Lecture P	eriods: 45 Tutorial Periods: -	Pr	actical F	Periods:	-	Total	Periods:	45
Text Books 1. Clifton B., Adva 2. Jure Leskovec, 3.Kaushik A., We <b>References Bo</b> 1. Sterne J., We 2. Brian Clifton, " 3. Jerri L. Ledford Pedro Sostre, "W 4. Avinash Kaush	nced Web Metrics with Google Analytics, Wile Anand Rajaraman, and Jeffrey D. Ullman , "M b Analytics 2.0, The Art of Online Accountabili <b>oks</b> eb Metrics: Proven methods for measuring web Advanced Web Metrics with Google Analytics' I and Joe Teixeira , "Learning Web Analytics: A eb Analytics For Dummies" , For Dummies, Se ik ,"Web Analytics 2.0: The Art of Online Acco	ey Publishing, lining of Mass ity and Scienc site success , Sybex, Thi A Beginner's econd Edition puntability and	Inc.2nd e ive Datas e of Cust , John Wi rd Edition Guide to C , 2012 Science	ed, 2012. ets" 2nd e omer Ce ley and S , 2012 Google Ar of Custor	edition, Cam ntricity, Wile ons,2002 nalytics", O'F ner Centricit	bridge Un yPublishir Reilly Medi y" , Sybex	iversity Pre ig, Inc. 1st a, 2010 , 2 <sup>nd</sup> Edition	ess, 2014 ed, 2010 n, 2009
	5-15/							

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1. https://www.mygreatlearning.com/courses/big-data-analytics-dse
2. https://intellipaat.com/big-data-hadoop-training/
3. https://www.edureka.co/comprehensive-hive

COs	Prog	ram O	utcom	Program Specific Outcomes (PSOs)				
	<b>PO1</b>	PO2	PO3	PSO1	PSO2	PSO3		
1	3	3	2	1		-	1	3
2	3	3	2	1		-	1	3
3	3	3	2	1		-	1	3
4	3	3	2	1		-	1	3
5	3	3	2	1		-	1	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ious Asse	End Semester	Total		
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Examination (ESE) Marks	Marks
Marks	1	10 15 10 5				60	100

Department	Artific	cial Intelligence and Data Science	Program	nme: <b>M</b>	.Tech.				
Semester	II		Course	Catego	ory: PE	*Enc	d Semeste	er Exam Ty	pe: TE
Course Code	P23A	DE205	Perio	ds / W	eek	Credit	Ma	ximum Ma	rks
	0/ .		L	Т	Р	С	CAM	ESE	TM
Course Name	Data V Powe	Visualization using Tableau and r Bl	3	-	-	3	40	60	100
Droroquisito	<b></b>		<u> </u>	<u> </u>				<u> </u>	
Fielequisite	- On co	mulation of the course, the stude	nts will h	o ahlo	to			BTM	lanning
		inpletion of the course, the stude			.0			(Highe	est Level)
Course	CO1	Apply the various Charts using Tat	bleau.						К3
Outcomes	CO2	Understand and apply Maps in Tal	bleau.						K3
	CO3			K2					
	CO4	Apply the Power Querry and M La	nguage ir	data.					K3
	CO5	Design the concents in data model	lling and (	roato a	dashh	hard			K3
IINIT-I	Introd	Design the concepts in data model	ining and t			Periode: 9			NJ
Data Visualization-	Tableau	Products- Connecting to data source –	Creating L	Jnivariat	e Charts	: Tables – Ba	ar araphs -	Pie charts	_
Sorting the graphs - Measures. Creating Palettes – Using da maps.	– Histog g Bivaria ates. Cre	rams – Line Charts – Using the Show Me te Charts: Tables – Scatter Plots – Swap ating Multivariate Charts – Acets – Area	e toolbar – S pping Row Charts – E	Stacked s and C Bullet Gr	Bar Graj olumns - aphs – c	ohs – Box Plo - Adding trend Jual axes char	ts – Showir d lines – Se ts – Gantt (	ng Aggregat electing colo charts – hea	e CO1 or at
UNIT-II	Maps	and Statistics using Tableau				Periods: 9			
Setting Geographic shapes – Customiz Bands -Adding Ref Dashboards – Crea	c Roles - zing Map ference ating Sto	<ul> <li>Placing marks on a Map – Overlaying los – Statistics: Add Reference Lines Ban Distribution-Working Reference Lines Bar rvboard</li> </ul>	Demograp ds and Dis ands and I	hic data tributior Forecast	– Creati n- Adding ting -Tre	ng choropleth Reference L nd lines and	n Maps – U ines -Addir Trend Mod	sing polygo ng Referenc els- Creatin	n CO2 e g
UNIT-III	Introd	luction to Power Bi				Periods: 9			L
Connection of Data Desktop-Flow of W	a Sourc ork in Po	e- Reporting Business Intelligence (BI), ower BI Desktop-Power BI Architecture-A	, Tradition A Brief Hist	al BI, S ory of P	elf-Servi ower BI.	ced BI-Power	BI Produc	cts-Power E	3I CO3
UNIT-IV	Powe	r Querry And M Language				Periods: 9			
Data Transformatic Query Editor, Quer IFELSE Condition and GROUP BY O Using Parameters	on, Bene y Editor ns, Trans ptions T with M L	of Data Transformation-Shape or T User Interface- The Ribbon (Home, Transform Column () Types-Remove Column ableGroup () Table. Sort () with Type C anguage	ransform I nsform, Ac ns (), Split Conversior	Data usi d Colun Column s PIVO	ng Powe nn, View s (),Repl T -Opera	er Query-Ove Tabs)-Basic ace Value() tion and Tabl	rview of Po Functions-I -Table. Dis e. Pivot()-L	ower Query M Language tinct Option ist Function	/ CO4  is is
UNIT-V	Data I	Vodeling				Periods: 9			
Data Modeling In One, One-to-Ma existing relation Dashboards.	ntroduc any (or iships -	tion -Relationship, Need of Relations Many-to-One), Many-to-Many - Aut Make Relationship Active or Inacti	ship -Rela oDetect t ve -Delet	tionship he rela e a rel	o Types tionship lationsh	, Cardinality , Create a r ip – Power	in Genera new relatio Bi servic	al <del>o</del> One-to onship, Ed e- Creatin	r- it g
Lecture Period	s: 30	Tutorial Periods: 15	Practic	al Perio	ods: -	Т	otal Perio	ods: 45	
Text Books									
1. Ashutosh 2. Brett Pov edition, 2 3 Alberto F	n Nande vell, Ma 018. errari a	eshwar, "Tableau Data Visualization ( Istering Microsoft Power BI: Expert to Ind Marco Russo, Analyzing Data wit	Cookbool echnique h Power l	", Pack s for ef 31 and 1	t Publis fective c Power F	hing Ltd., 20 lata analytic Pivot for Exce	)13. s and bus el 1 <sup>st</sup> editi	iness intel	ligence, 1 <sup>s</sup>
Reference Book	S						.,	,	
<ol> <li>Scott Mu</li> <li>Cole Nus</li> <li>Stephen</li> <li>Nathan Y</li> <li>Edward F</li> </ol>	rray, Int sbaumo Few, In ⁄au, Dat R. Tufte	eractive Data Visualization for the W er Knaflic, Storytelling with Data: A Da formation Dashboard Design: Displa ta Points: Visualization That Means S , The Visual Display of Quantitative I	/eb: An In ata Visua lying Data Something Informatic	troduct ization for At- g, 1 <sup>st</sup> ec n, 2 <sup>nd</sup> e	ion to D Guide fo a-Gland dition, 20 edition, 2	esigning with or Business e Monitoring 013. 2001	h D3, 2 <sup>nd</sup> e Professior g, 2 <sup>nd</sup> editio	edition, 20 <sup>.</sup> nals, 1 <sup>st</sup> ed on, 2013.	17. ition, 2015
		- > \							
	5-1	1 3 1							

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#### 1. https://www.tableau.com/

- 2. https://www.guru99.com/what-is-tableau.html
- 3. https://www.datacamp.com/tutorial/data-visualisation-powerbi
- 4. https://learn.microsoft.com/en-us/power-query/power-query-ui
- 5. https://www.tutorialspoint.com/power\_bi/power\_bi\_data\_modeling.html

\* TE – Theory Exam, LE – Lab Exam

### COs/POs/PSOs Mapping

COs	I	Progra	m Out	Program Specific Outcomes (PSOs)					
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	3	2	-	-	-	1	2	1
2	3	3	3	-	1	-	2	2	1
3	2	3	2	1	2	-	2	2	1
4	3	3	3	1	3	-	2	2	1
5	3	3	3	1	3	-	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment Continuous Assessment Marks (CAM) End Semester							Total
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Examination (ESE) Marks	Marks
Marks	1	10		10	5	60	100

5. AS / --

Department	Artificial Intelligence and Data Science	Program	nme: <b>M</b> .	Tech				
Semester	Ш	Course	Catego	ry: <b>PE</b>	*End	I Semeste	r Exam Typ	e: TE
Course Code		Perio	ds / We	ek	Credit	Max	ximum Marl	٢S
Course Coue	rzsadlzoo	L	Т	Р	С	CAM	ESE	ТМ
Course Name	Predictive Modelling	3	-	-	3	40	60	100
		-						
Prerequisite	NIL				<u>.</u>	<u>+</u>		
	On completion of the course, the stude	nts will be	e able t	0			BT Ma (Highes	apping st Level)
Course	CO1 Design and analyze appropriate pre-	dictive mo	dels				K	3
Outcomes	CO2 Define the predictive models using F	PMML.					K	3
	<b>CO3</b> Apply statistical tools for analysis.						K	3
	CO4 Use various analytical tools available	e for predi	ctive m	odeling			K	(3
	CO5 Apply predictive modeling markup la	anguage ir	data n	nanipul	ation .		K	(3
UNIT-I	Introduction To Predictive Modeling			•	Periods: 9			
Core ideas in data	mining - Supervised and unsupervised learning	J - Classific	cation ve	s. Predic	tion - Steps in	n data mini	ing- SEMMA	
Approach - Sampli for predictive analy	ng -Pre-processing - Data cleaning - Data Partiti tics.	oning - Bui	lding a ı	model -	Statistical mod	dels - Statis	stical models	CO1
UNIT-II	Predictive Modeling Basics				Periods: 9			
Data splitting – Bal Profit/loss/prior pro	ancing- Over fitting –Oversampling –Multiple Reg babilities - Model specification - Model selection	gression Ar - Multivaria	tificial no ite Analy	eural ne ⁄sis	tworks (MLP)	- Variable i	mportance-	CO2
UNIT-III	Predictive Models				Periods: 9			
Association Rules- Model – Regressio Linear Regression Assessment of a si	Clustering Models –Decision Trees- Ruleset Moo n Models – Regression Trees – Classification & I Scorecards – Support Vector Machines – Time S nole model.	dels- KNear Regression Series Mod	rest Neiǫ i Trees ( els - Coi	ghbors - CART) mpariso	- Naive Bayes – Logistic Reg n between mo	- Neural N ression – N dels - Lift c	etwork /lultiple hart	CO3
UNIT-IV	Predictive Modeling Markup Language				Periods: 9			1
Introduction to PMI Model Support – N	ML – PMML Converter - PMML Structure – Data lodel Verification.	Manipulatio	on in PN	IML – P	MML Modeling	g Technique	es - Multiple	CO4
UNIT-V	Technologies And Case Studies				Periods: 9			L
Weka – RapidMir LanguageReal t	her – IBM SPSS Statistics- IBM SPSS Modeler – ime case study with modeling and analysis.	SAS Enter	prise Mi	ner – Ap	ache Mahout	– R Progra	imming	CO5
Lecture Period	s: 45 Tutorial Periods: 15	Practica	al Peric	ods: -	Т	otal Peric	ods: 60	L
Text Books		.1			i			
<ol> <li>Statistical and Edition,2011</li> <li>Predictive Mc</li> <li>Mastering Prediction</li> </ol>	d Machine-Learning Data Mining Techniques Ideling with SAS Enterprise Miner Practical S edictive Analytics with R,Second Edition: Ma	s for Bette Solutions f achine lear	r Predic for Busi rning te	ness A chnique	odeling and A pplications, T es for advanc	Analysis o Third Edition Ced model	f Big Data, on,2017 s,2017	Second
Reference Book	S							
<ol> <li>Kattamuri S. S Edition, SAS Pub</li> <li>Alex Guazzell Data Mining and</li> <li>Ian H. Witten, Data Manageme</li> <li>Eric Siegel , "I</li> <li>Conrad Carlbe</li> </ol>	arma, "Predictive Modeling with SAS Enterp olishing, 2017. i, Wen-Ching Lin, Tridivesh Jena, James Ta Predictive Analytics", 2 <sup>nd</sup> Edition, Create Sp Eibe Frank , "Data Mining: Practical Machin nt Systems, Morgan Kaufmann, 3 <sup>rd</sup> Edition, 2 Predictive Analytics: The Power to Predict W erg, "Predictive Analytics: Microsoft Excel", 1	orise Mine Iylor, "PMI ace Indep Ie Learnin 2011 Vho Will C <sup>st</sup> Edition,	r: Pract ML in A endent g Tools lick, Bu Que Pt	ical Sol ction U Publisi and Te y, Lie, e ublishin	utions for Bu nleashing the hing Platform echniques", N or Die", 2 <sup>nd</sup> E g, 2012.	isiness Ap e Power o i,2012 Morgan Ka dition, Wil	pplications", f Open Star aufmann Se ey, 2016.	3 <sup>rd</sup> ndards for ries in
	5-25/							

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2.https://www.coursera.org/learn/predictive-modeling-analytics

3.https://bookdown.org/egarpor/PM-UC3M/ 4.https://cics.nd.edu/research/applications/materia

5.https://www.netsuite.com/portal/resource/articles/financial-management/predictive-modeling.shtml

#### TE – Theory Exam, LE – Lab Exam

#### **COs/POs/PSOs Mapping**

COs		Progra	m Out	Program Specific Outcomes (PSOs)					
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	3	2	-	-	-	1	2	1
2	3	3	3	-	1	-	2	2	1
3	2	3	2	1	2	-	2	2	1
4	3	3	3	1	3	-	2	2	1
5	3	3	3	1	3	-	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ious Asse	essment Marks (	(CAM)	End Semester	Total
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Examination (ESE) Marks	Marks
Marks	1	0	15	10	5	60	100

Department	Artificial Intelligence and Data Science	Program	nme: M	Tech				
Semester	П	Course	Catego	ry:PE	*Enc	d Semester	Exam Typ	e: TE
Course Code	P22ADE207	Perio	ds / We	ek	Credit	Maxi	mum Marł	เร
Course Code	P23ADE207	L	Т	Р	С	CAM	ESE	TM
Course Name	Next Generation Database Systems	3	-	-	3	40	60	100
	<u> </u>							
Prereguisite	NIL	.L	L	L				
	On completion of the course, the studer	nts will be	e able t	0			BT Ma (Highes	apping st Level)
Course Outcomes	CO1 Understanding the market and techn databases.	ology for	ces lead	ding to t	oday's next	generation	К	.3
	CO2 Mastering in Hadoop architecture with	th queryin	g in vai	rious Ha	adoop comp	onents	K	3
	CO3 Demonstrating the working of XML a	and JSON	Docum	nent Dat	tabases		K	3
	<b>CO4</b> Understanding the database application	tions orie	nted to	Graph a	and Column	databases	ĸ	3
	<b>CO5</b> Applying the Distributed Database p	attorne ar	d consi	istancy	models in M	longoDB	ĸ	<u>`</u> 2
	HBase and Cassandra			Istericy		longodd,		5
UNIT-I	Database Revolution				Periods: 9	)		
First Database Rev	volution – Second Database Revolution: Relation	nal Theory	– Trans	action M	odels – First	Relational D	atabases –	
Database Wars - C Hadoop – Cloud Co	lient-server Computing – Object Oriented Progra omputing – Document Databases – NEWSQL.	mming and	OODB	MS – Th	ird Database	Revolution: (	Google and	CO1
UNIT-II	Hadoop: Open-Source Google Stack				Periods: 9			
Hadoop's Origin – I Data, Hadoop's Ec	Power of Hadoop – Hadoop's Architecture – Wor	king with H	ladoop: Data wit	Loading	Data – Hand	ling Files – G	etting	CO2
	Document Databases				Poriode: 0		Jop mes.	i
XMI Databases: X	MI Tools and Standards – XMI support in Relati	ional Syste	ms – .IS		ument Datab	ases – JSON	and A.IAX	
– Data Models in D	ocument Databases – Early JSON Databases –	MemBase	and Co	uchBase	– MongoDB			CO3
UNIT-IV	Graph and Column Databases				Periods: 9	)		
Graph Database: R Internals – Graph C Compression, Colu	DBMS Pattern for Graphs – RDF and SPARQL - Compute Engines. Column Databases: Data Ward	– Property ehouse Sc /ertica – Cr	Graphs hema –	and Nec Columna	94j – Gremlin ar Alternative Architectures	<ul> <li>Graph Data</li> <li>(Columnar</li> </ul>	abase	CO4
UNIT-V	Distributed Database Patterns and Cons	sistency	Models	6	Periods: 9	•		
Distributed Databas Replication - HBase Cassandra Consist	se Patterns: Distributed Relational Databases – N e – Cassandra. Consistency Models: Types of Co rency	Non-relation	nal Distr – Consi	ibuted D stency ir	atabases – M n MongoDB –	longoDB Sha Hbase Cons	arding and sistency –	CO5
Lecture Period	s: 45 Tutorial Periods: 15	Practica	al Peric	ods: -	Т	otal Period	ls: 60	
Text Books		<u>.</u>						
1. Enhancing Ava Kaur 2. NoSQL A com	ailability for NoSQL Database Systems using plete guide,2021 edition	g Failover	Techni	ques,Pr	riyanka Gott	er, Kiranbir	Kaur, Tan	veer
Reference Book	S							
1. Guy Harrison, 2. Chanchal Sing Packt Pu	"Next Generation Databases: NoSQL, NewS h and Manish Kumar, "Mastering Hadoop 3: blishing, 2019.	SQL, and : Big data	Big Dat proces	a", Apresing at s	ess Publishe scale to unic	er, 2016 ock unique b	ousiness ir	ısights",
3. Subhashini Ch Apress P 4. Jeff Friesen "J	ellappan, Dharanitharan Ganesan, "MongoE ublisher, 2019 Iava XML and JSON: Document Processing	)B Recipe	es: With SF" Ar	Data M	lodeling and	l Query Buil 9	ding Strate	egies",
			_ , , , , , , , , , , , , , , , , , , ,			-		
	<u>`</u>							
	5.15/-							

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- 2. https://cloudxlab.com/blog/big-data-solution-apache-hadoop-and-spark/
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- 4. https://www.geeksforgeeks.org/document-databases-in-nosql/
- 5. https://towardsdatascience.com/cap-theorem-and-distributed-database-management-systems-5c2be977950e

TE – Theory Exam, LE – Lab Exam

#### **COs/POs/PSOs Mapping**

COs	ļ	Progra	m Out	comes	s (POs)		Program Specific Outcomes (PSOs)				
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3		
1	2	3	2	-	-	-	1	2	1		
2	3	3	3	-	1	-	2	2	1		
3	2	3	2	1	2	-	2	2	1		
4	3	3	3	1	3	-	2	2	1		
5	3	3	3	1	3	-	2	2	1		

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ous Asse	essment Marks (	(CAM)	End Semester	Total
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Examination (ESE) Marks	Marks
Marks	1	0	15	10	5	60	100

5-15/-

Department	Artificial Intell	Artificial Intelligence and Data Science Programme: M.Tech								
Semester	II	Course Category: PE *End Semester Exam Type: 1								
Course Code	D22 V DE208		Perio	ds / W	eek	Credit	Ma	ximum Mark	s	
Course Code	FZJADE200		L	Т	Р	С	CAM	ESE	ТМ	
Course Name	Advanced Alg	orithms	3	-	-	3	40	CAM ESE 40 60 BT M (Highes F BT M (Highes F F F F BT M (Highes F F F F F F F F F F F F F		
Prereguisite	NIL			<u>i</u>	<u> </u>		L			
	On completion	n of the course, the stud	ents will b	e able	to			BT Ma (Highes	apping st Level)	
Course	CO1 Analyze	algorithms to determine al	lgorithm cor	rectne	SS			K	3	
Outcomes	CO2 Analyze	algorithms to determine tir	me efficienc	;y				K	3	
	CO3 Master a	variety of advanced data	structures a	and the	ir implei	mentations		K	3	
	CO4 Master a	variety of different algorith	hm design t	echniq	ues			K	3	
	CO5 Apply an	d implement the learnt alo	orithm desi	an tecl	nniques	to solve pro	blems	К	3	
UNIT-I	Basics of Algo	prithm Analysis		3		Periods: 9			_	
Computational Trac survey of common	ctability – Asympto running times – A	tic Order of Growth – Impler more Complex Data Structur	nenting the S re: Priority Q	Stable N ueues.	Aatching	Algorithm Us	ing Lists ar	ıd Arrays – A	CO1	
UNIT-II	Graphs and G	reedv Alaorithms				Periods: 9				
Graphs: Basic Defi	nitions and Applic	ations – Graph connectivity a	and Graph tra	aversal	– Implem	enting Graph	n Traversal	using	CO2	
Queues and Stacks Greedy Algorithm Argument – The Mi – Huffman Codes a	S – Testing Bipartit s: Interval Schedu nimum Spanning and Data Compres	eness: An application of Bre ling: The Greedy Algorithm S Tree Problem – Implementing sion	adth First se Stays Ahead g Kruskal's A	arch. – Optin Igorithr	nal Cachi n: The Ur	ng: A More C nion-Find Da	Complex Ex ta Structure	change – Clustering		
UNIT-III	Divide and Co	nquer				Periods: 9			L	
Points – Integer Mu Dynamic Programm Sums and Knapsac Cycles in a Graph	e. The Merge soft Iltiplication <b>Dynam</b> hing: Memoization ks: Adding a varia	<b>ic Programming:</b> Weighted or Iteration over Subproblem ble – Shortest Paths in a Gra	I Interval Sch I s – <b>Segmer</b> aph – Shorte	s – Cou ieduling ited Le ist Path	: A Recu ast Squa s and Dis	rsive Proced rsive Proced res: Multi-wa tance Vector	ure – Princi ay Choices Protocols	ples of – Subset – Negative	CO3	
	Network Flow		Ma		-1	Periods: 9	Lational C	N		
Good Augmenting I	Problem and the Paths – A First Ap	Pord-Fulkerson Algorithm – plication: The Bipartite Match	ning Problem	ows and – Disjo	d Minimu bint Paths	in Directed a	and Undired	ted Graphs.	CO4	
UNIT-V	NP and Comp	utational Intractability				Periods: 9				
Polynomial-Time I Partitioning Proble	Reductions – Effic ems – Graph Colo	ient Certification and the Def ring – Co-NP and the Asymm	inition of NP netry of NP.	– NP-C	complete	Problems – S	Sequencing	Problems –	CO5	
Lecture Perio	ds: 45	<b>Tutorial Periods: 15</b>	Practic	al Per	riods: ·	• 7	Total Per	iods: 60		
Text Books										
<ol> <li>Advanced Date</li> <li>Algorithms, Ro</li> </ol>	ta Structures An bert Sedgewick	d Algorithms ,1 <sup>st</sup> edition 2 and Kavin Wayne,4 <sup>th</sup> edi <sup>,</sup>	2015 tion							
Reference Boo	ks									
1. Jon Kleinberg,	ÉvaTardos, "Alg	orithm Design",Pearson E	Education L	imited 2	2014.					
2. Thomas H. Cor 3. Ellis Horowitz, Universities Press 4. AnanyLevitin, "	men, Charles E. SartajSahni and s, Hyderabad, 20 Introduction to tl	Leiserson, Ronald L. Rive SanguthevarRajasekarar 008. ne Design and Analysis of	est, Clifford n, "Fundame f Algorithms	Stein, entals o ", Thiro	d Edition	ction to Algo uter Algorith , Pearson E	orithms", Northeast, Northeast, Northeast, Northeast, Northeast, Northeast, Northeast, Northeast, Northeast, No	And Edition, Asia, 2008.	009.	
Web Reference	es									
<ol> <li>https://www.so</li> <li>https://www.co</li> <li>https://www.tu</li> <li>https://www.co</li> <li>https://cseweb</li> </ol>	caler.com/topics. odingninjas.com, itorialspoint.com s.cmu.edu/~avrir o.ucsd.edu//class	/analysis-of-algorithm/ /studio/library/greedy-algo /data_structures_algorithr n/451f11/lectures/lect102 ses/sp05/cse101/Day19N	prithm-in-gra ns/divide_a 5.pdf P.pdf	aph-the nd_coi	eory nquer.ht	m				

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COs		Progra	m Out	comes	s (POs)	)	Prog Outco	ecific PSOs)		
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	
1	2	3	2	-	-	-	1	2	1	
2	3	3	3	-	1	-	2	2	1	
3	2	3	2	1	2	-	2	2	1	
4	3	3	3	1	3	-	2	2	1	
5	3	3	3	1	3	-	2	2	1	

## Correlation Level: 1 - Low, 2 - Medium, 3 – High

Assessment		Continu	ous Asse	essment Marks (	(CAM)	End Semester	Total
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Examination (ESE) Marks	Marks
Marks	1	0	15	10	5	60	100

,	Artificial Intelligence and Data Science	cience Programme : M.Tech.							
Semester	1	Course Category: PE *End SemesterExamType							
Course Code		Pe	riods/Wee	ək	Credit	Ma	aximumMa	arks	
	P23ADE209	L	Т	Р	С	d Semeste Max CAM 40 40 ns nponents – nmon data ns, Introdu g vs. multi- ion to busir ta Wareho ng mainter h & Text An otalPerioc Edition, 2( pwledge Ei d Busino ', Wiley P 7 shers, Har 2018 , Tata Mc(	ESE	TM	
Course Name	Business Intelligence and Reporting	3	0	0	3	40	60	100	
Droroquicito	Basic Artificial Intelligence and Data Scie	000							
Fielequisite	On completion of the course, the stude	nte will	he ahle f	ho			RT Mar	onina	
							(Highes	st Level	
Course	CO1 Understand the Business intelligence	ce frame	work and	respo	nsibilities		K2		
Outcome	CO2 Design the ETL process for handlin	g the da	ta from a	given	source		K3		
	CO3 Design a star / snowflake schema f	or a give	n problen	n.			K3		
	<b>CO4</b> Ability to illustrate the data mining c	oncepts	with suita	able ex	amples.		K3		
	<b>CO5</b> Ability to apply classification and pr	ediction	concepts	to var	ious applicati	ons	K2c		
UNIT – I	Introduction to Business Intelligence				Periods:9				
BI Definitions &C	oncepts, BI Framework, Data Warehousing conce	epts and i	ts role in Bl	, BI In	frastructure Co	mponents	– BI Proce	ss,	
BI Technology, B	I Roles & Responsibilities, Business, Application	s of BI, B	l best prac	tices				CO1	
UNIT – II	Basics of Data Integration				Periods:9			I	
approaches,Meta using Pentaho da UNIT – III	a data - types and sources, Introduction to data qu ata Integration (formerly Kettle).	ality, data	a profiling o	concep	ts and applicat	ions, Introc	luction to E	TL	
Data Modelling I	ntroduction to data and dimension modelling, m	ultidimer	sional data	a mode	el. ER Modellir	a vs. mult	i-dimensio	nal	
modelling, conce	pts of dimensions, facts, cubes, attribute, hierarcl	nies, star	and snowf	lake sc	hema, Introduc	ction to bus	siness metr	ics	
and KPIs, Creati	ng cubes using Microsoft Excel.				Doriodou0				
Overview of ma	nagerial, strategic and technical issues associ	ated with	n Business	s Intell	idence and D	ata Wareh	ouse desid	n.	
implementation, Boards and Scor	and utilization. Critical issues in planning, physic ecards Creation.	al design	process,	deploy	ment and ongo	oing mainte	enance. Da	sh	
UNIT – V	Future of Business Intelligence				Periods:9				
Emerging Techn Advanced Visual	ologies, Machine Learning, Predicting the Future lization – Rich Report, Future beyond Technology	e with the /.	help of Da	ata Ana	alysis, BI Sear	ch & Text	Analytics –		
LecturePerio	ds:45 TutorialPeriods:0	Pract	icalPerio	ds:-0	٦	otalPerio	ods:45		
Text Books									
1. RNPr	asad, Seema Acharya: Fundamentals of Bus	siness A	nalytics, \	Niley	ndia, Second	Edition,	2016.		
2. David L	_oshin: Business Intelligence: The Savvy Ma	anager's	Guide., L	atest I	Edition By Kn	owledge	Enterprise	,2018.	
3. Efraim System	Iurban, Ramesh Sharda, Dursun s", 9 th Edition, Pearson 2018	Delen	, "Decis	sion	Support ar	id Busi	ness Int	elligeno	
4. Carlo V	/ercellis, "Business Intelligence: Data Mining	and Opt	imization	for De	cision Making	", Wiley	Publicatio	ns, 201	
5. Grossn	nann W, Rinderle-Fundamental of Business	Intellige	nce 1th E	dition,	Springer, 20	17			
Reference Boo	oks								
1. J.Han a	and M. Kamber, "Data Mining: Concepts and	Techni	ques", Mo	rgan k	Kaufman publ	ishers, Ha	arcourt Inc	lia pvt.	
Ltd. La	test Edition, 2016			A 1 1'	\	~~ / ~			
2. Larissa	i Terpeluk Moss, ShakuAtre, "Business Intel	ligence	oadmap"	, Addis	son Weseley.	2018	<u> </u>	~~ / ~	
3. CindiH	owson, "Successful Business Intelligence: S	ecrets to	o making	Killer E	BI Application	", Tata M	cGraw Hill	, 2018	
4. Mike B	iere, "Business intelligence for the enterprise	e", Addis	on Wese	ley, Αι	usgust 2017				
5. Dorian	Pyle, "Business Modeling and Data Mining".	, Elsevie	r Publicat	ion, 2	016				

Web	Refer	ences
	1.	https://www.investopedia.com/terms/b/business-intelligence-bi.asp
	2.	https://www.cio.com/article/272364/business-intelligence-definition-and-solutions.html
	3.	https://www.javatpoint.com/power-bi

# TE – Theory Exam, LE – Lab Exam

## COs/POs/PSOs Mapping

COs		Progra	m Out	comes	s (POs)	)	Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	
1	2	3	2	-	-	-	1	2	1	
2	3	3	3	-	1	-	2	2	1	
3	2	3	2	1	2	-	2	2	1	
4	3	3	3	1	3	-	2	2	1	
5	3	3	3	1	3	-	2	2	1	

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Assessment		Continu	ous Asse	essment Marks	(CAM)	End Semester	Total
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Examination (ESE) Marks	Marks
Marks	1	0	15	10	5	60	100

Department	Artific	ial Intelligence and Data Science	Program	nme: M	.Tech.				
Semester	11		Course	Catego	ry : <b>PE</b>	*End	Semeste	r Exam Typ	be: TE
Course Code	D23 VI	76910	Peric	ds / We	ek	Credit	Max	kimum Mar	ks
Course Coue	F ZJAI		L	Т	Р	С	CAM	ESE	ТМ
Course Name	Strea	ning Analytics	3	-	-	3	40	60	100
	L								
Prerequisite	-		L	i	L		<b>i</b> i		.1
	On co	mpletion of the course, the studer	nts will b	e able t	to			BT M	apping
								(Highes	st Level)
Course	CO1	Explain the need for stream compu	iting.					ľ	(2
Outcomes	CO2	Comprehend the architecture of str	ream ana	lytics.				k	(3
	CO3	Build data flow management pipeling	nes for st	reams.				ľ	(2
	CO4	Process the streaming data.						ł	(3
	CO5	Deliver the results of streaming and	alytics.					k	(3
UNIT-I	Intro	duction to stream computing				Periods: 9		l	
Streaming Data –	Sources	- Difference between Streaming Data	and Static	Data.	Overviev	/ of Large-Sc	ale Stream	Processing	)
Engines – Issues ir	n Stream	Processing.							CO1
UNIT-II	Strea	ning analytics architecture				Periods: 9			
Phases in Streamir Tolerance - Service	ng Analy e Configi	tics Architecture - Vital Attributes - High A uration and Management – Apache ZooK	Availability Geoper.	– Low L	atency -	- Horizontal S	calability-F	ault	CO2
					Ĩ				
UNIT-III Distribute d Data El	Data f	low management		7-		Periods: 9	<b>T</b>	- 0 51-	
Passing.	ows – At	Least One Delivery – Apache Katka – A	pache Fiu	me – ∠e	ro IVIQ -	Messages, EV	/ents, Task	S& FIIE	CO3
UNIT-IV	Proce	ssing & storing streaming data				Periods: 9			
Distributed Stream Apache Spark Stre	Data Pro aming E	ocessing: Co-ordination, Partition and Me xamples Choosing a storage system – N	erges, Trar loSQL Stor	rage Sys	s. Duplic stems.	ation Detectio	on using Blo	om Filters -	CO4
UNIT-V	Delive	ering streaming metrics				Periods: 9			
Visualizing Data -	- Mobile	Streaming Apps –Times Counting and S	ummation	<ul> <li>Stoch</li> </ul>	astic Op	timization – D	elivering Ti	me Series	CO5
Lecture Period	s: 30	Tutorial Periods: 15	Practica	al Perio	ods: -	Т	otal Perio	ds: 45	
Text Books						L			
1. By Albert	: Bifet, F	Ricard Gavaldà, Geoff Holmes, Bernh	nard Pfah	ringerS	tuart, M	achine Leari	ning for Da	ata Stream	s, The
MIT Pres	s, 2018						-		
2. Ted Duni	ning, El kr. "Lar	en Friedman, Streaming Architecture	e, O'Reilly nd Manac	/ Media	, Inc, M	ay 2016.			
Reference Book	n, ∟αlξ Si	ge ocale and big Data. Flocessing al		Jeineill	, 01/01	1000, 2014.			
1. Jure Les	kovec. A	AnandRaiaraman, Jeffrev D. Ullman,	"Minina c	of Mass	ive Data	sets". Camb	oridae Uni	versitv Pres	ss. 2014.
2. Paul C Z	ikopoulo	os, Chris Eaton, Paul Zikopoulos, "Ur	nderstand	ling Big	Data: A	nalytics for	Enterprise	Class Had	loop and
Streamin	g Data"	, McGraw-Hil, 1st edition, 2011.							
3. Byron Ell	is, "Rea " <del>-</del>	Il-Time Analytics: Techniques to Ana	lyze and	Visualiz	e Strea	ming Data",	Wiley, 1st	edition, 20	)14.
4. Bill Frank Wilev. 20	ks, ≃⊺an )12.	ning The Big Data Tidal Wave Finding	g Opporti	inities l	n Huge	Data Stream	is with Ac	wanced Ar	alytics",
Web References	5								
1. https://ww	ww.tuto	ialspoint.com/ins-and-outs-of-data-si	treaming.						
2. https://ww	ww.java	tpoint.com/kafka-key-concepts-of-str	eam-proc	essing					
3. https://flu	me.apa	che.org/.							
4. https://ww * TE	ww.geel	kstorgeeks.org/data-stream-in-data-a	analytics/						
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COs		Progra	m Out	comes	s (POs)	)	Program Specific Outcomes (PSOs)			
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	
1	2	3	2	-	-	-	1	2	1	
2	3	3	3	-	1	-	2	2	1	
3	2	3	2	1	2	-	2	2	1	
4	3	3	3	1	3	-	2	2	1	
5	3	3	3	1	3	-	2	2	1	

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		Continuo	ous Assess	sment Marks (C	CAM)	End	
ASSESSMENT	CAT 1	CAT 2	Model Exam	Assignment	Attendance	Semester Examination (ESE) Marks	Total Marks
Marks	1	0	15	10	5	60	100

Department	Artificial Intelligence and Data Science Programme: M.Tech.											
Semester	11			Course	Catego	ry : PE	*En	d Semester	Exam Typ	e: <b>TE</b>		
Course Code	D02 A I	75244		Perio	ds / We	eek	Credit	Maxi	mum Mark	S		
Course Code	PZSAI			L	Т	Р	С	CAM	ESE	TM		
Course Name	Machi	ne Lear	ning with Large Datasets	3	-	-	3	40	60	100		
	L											
Prerequisite	-			i	<u>.</u>	11		L	L			
•	On co	mpletio	n of the course, the studer	nts will b	e able t	to			BT Ma	pping		
									(Highes	t Level)		
Course	CO1	Learn	various types of algorithms t	o handle	the larg	ge data.			K	2		
Outcomes	CO2	Apply	parallel and distributed ML te	echniques	s to get	the insi	ghts of the I	arge data.	K	3		
	CO3	Identif	y suitable ML framework to c	develop th	e real-	world ap	plication.		K	2		
	CO4	Demo	K	3								
	CO5	Develo	Develop scalable learning techniques both in standalone and distributed settings K3									
UNIT-I	Stream	ndata m										
Stream Data mode	el, sampl	ing data	in a stream, filtering algorithms	s, counting	distinct	t elemen	ts in a stream	n, estimating	moments,			
Decaying windows,	, Naïve E	Baye's, Fr	equent Item sets: Handling larg	jer dataset	s in mer	nory, coι	unting freque	nt itemset in a	a stream.	CO1		
UNIT-II	Tools	for larg	e data sets				Periods: 9	)				
Introduction to Had algorithms, joins in	oop, Hao Hadoop	doop stre , similarit	aming Debugging Hadoop, Con y joins, page rank, spark, phras	nbiners, So e finding.	calable o	classifica	tion, Abstrac	s for map-re	duce	CO2		
UNIT-III	Gradi	ent desc	cent and Hash kernels				Periods: 9					
Learning as optimiz	zation, Lo	ogistic reg	gression with SGD, Efficient reg	ularized S	GD, Has	sh kernel	ls for logistic	regression, m	natrix			
factorization with S	GD, Dist	ributed m	natrix factorization with SGD.							CO3		
UNIT-IV	Parall	el mach	ine learning algorithms &	Randomi	zed		Periods: 9					
Devellet neve entre n	algori	thms			siana of F		trace Dende	الانتصار والمتصالية	h	~~ /		
Bloom filters, Local	, parallel ity sensi	tive hash	ing, online locality sensitive has	paraller de: hing.	SIGHTOFE	Jecision	liees. Kanuu	mizeu algom	11115.	C04		
UNIT-V	Open	source	ML tools				Periods: 9	)	L			
Computer vision-S	SimpleC	V, Tessar	act OCR, Detectron, Natural La	anguage Pi	ocessin	ig- Stanfo	ord core NLP	, Music and A	Audio	C 0 5		
analysis-LibROSA	A, Other	tools-KNI	ME and Orange.							005		
Lecture Period	s: 30		Tutorial Periods: 15	Practica	al Peric	ods: -	٦	otal Period	ls: 45			
Text Books												
4. Leskoved	c, Jure,	AnandR	ajaraman, and Jeffrey David	Ullman. I	Vining	of mass	ive data set	s. Cambrido	ge universi	ty press,		
5. Bekkerm	an, Ror	, Mikhai	I Bilenko, and John Langford	l, eds. Sc	aling up	o machii	ne learning:	Parallel and	d distribute	d		
approach	nes. Car	nbridge	University Press, 2011.				-					
6. John T. V	Volohar	n, "Maste	ering Large Datasets with Py	thon", Ma	nning F	Publicati	ions, 2020.					
	S	Vaabua	Panaia and Aaron Courvilla	Doopla	ornina		2016					
6 Wilt Nich	ow, ran, nolas T	rosnua he cuda	handbook. A comprehensive	. Deep lea e quide to	aning. anu nr	ooramn	ning Pearso	n Education	n 2013			
7. Frank Pa	ne , "Ha	ands On	Data Science and Python M	lachine Le	earning	", Packt	Publishers,	2017.	1, 2010.			
8. Abhishek	Kumar	, Ashuto	sh Kumar Dubey, Sreenatha	a G. Anav	atti, Pra	amod Si	ngh Rathor	e, Machine I	Learning			
Approach	hes and	Applicat	tions in Applied Intelligence f	for Health	care Da	ata Anal	lytics, 1st E	dition, Marcl	h 10, 2022	•		
9. White, IC	лп. пас	loop. Th		ivieuia, ini	J. , ZUT	۷.						
5. https://ww	ww neel	sforgee	ks.org/splitting-data-for-mac	hine-learr	nina-ma	odels/						
6. https://ww	ww.java	tpoint.co	m/data-preprocessing-mach	nine-learni	ing.							
7. https://tov	wardsda	atascien	ce.com/beginners-guide-to-n	nachine-le	earning	-with-big	g-data-d6db	b155673c.				
* TE –	Theory	e Exam,	LE – Lab Exam									

5-15/-

COs		Progra	m Out	comes	)	Program Specific Outcomes (PSOs)				
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	
1	2	3	2	-	-	-	1	2	1	
2	3	3	3	-	1	-	2	2	1	
3	2	3	2	1	2	-	2	2	1	
4	3	3	3	1	3	-	2	2	1	
5	3	3	3	1	3	-	2	2	1	

Correlation Level: 1 - Low, 2 - Medium, 3 – High

		Continuo	CAM)	End			
ASSESSMENT	CAT 1	AT 1 CAT 2		Assignment	Attendance	Semester Examination (ESE) Marks	Total Marks
Marks	1	0	15	10	5	60	100

Department	Artificial Intelligence and Data Science Programme: M.Tech.										
Semester	11			Course	Catego	ry : <b>PE</b>	*End	Semester	Exam Typ	e: TE	
Course Code		DE010		Peric	ds / We	ek	Credit	Maxi	mum Marł	٢S	
Course Code	PZJA	DEZIZ		L	Т	Р	С	CAM	ESE	ТМ	
Course Name	R for	Data Scie	ence	3	-	-	3	40	60	100	
Prerequisite	-				<u>i</u>	<u>l</u> l				<u>.</u>	
Troroquiente	On co	ompletion	of the course, the stude	nts will b	e able t	to			BT Ma	apping	
			· · · · · · · · · · · · · · · · · · ·						(Highes	st Level)	
Course	CO1	Study a	nd use basic fundamental	concepts	to solve	e the rea	al-world prob	lem using	K	2	
Outcomes		R progr	amming language.		-						
	CO2	Design	and implement the solution	n using sc	alar, ve	ctors, m	natrices and	statistical	K	.3	
	<u>^</u>	Problems in R program.     Program using data frame list to provide the colution     K2									
	to solution the program using data frame, list to provide the solution K3										
	COA Study about factors and tables and to solve statistical problems V2										
	004				Jatlas					.2	
	005	Study M	inimize and maximize fund	tions, sim	ulation	and visi	ualization an	d statistical	ĸ	.2	
I INIT_I	Introd	duction	using K.				Pariode: 9				
Overview of R. R d	ata type	s and object	ts, reading and writing data, s	sub setting	R Obiec	ts. Essei	ntials of the R	Language, I	nstalling R		
Running R, Packag	es in R,	Calculation	is, Complex numbers in R, Ro	unding, Arit	hmetic,	Modulo a	and integer qu	otients, Varia	able names	CO1	
and assignment, O	perators	s, Integers,	Factors, Logical operations.								
UNIT-II	Contr	rol Structu	ures and Vectors				Periods: 9				
Control structures,	function	s, scoping r	ules, dates and times, Introdu	iction to Fui	nctions,	preview	of Some Impo	rtant R Data	Structures,	CO2	
Vectors, Character	Strings,	Matrices, L	ists, Data Frames, Classes V Working with logical subscri	ectors: Gen	erating s		es, Vectors an	d subscripts	, Extracting		
Vector Elements, C	btaining	g the Length	of a Vector, Matrices and Ar	ravs as Veo	tors Vector	ctor Arith	metic and Loc	ical Operation	ons, Vector		
Indexing, Common	Vector	Operations		.,				,	-,		
UNIT-III	Lists	and Data	Frames				Periods: 9			<u>.</u>	
Lists: Creating Lists	s, Gener	ral List Ope	rations, List Indexing Adding	and Deletii	ng List E	Elements	, Getting the S	Size of a List	, Extended		
Example: Text Cor	ncordan	ce Accessi	ng List Components and Va	lues Apply	ing Fun	ctions to	Lists, Data	Frames, Cre	ating Data	CO3	
Frames, Accessing		rames, Oth	er Matrix-Like Operations			Ĩ					
UNIT-IV	Facto	ors and Ta	bles and Object-Oriente	d Progran	nming		Periods: 9				
Knowledge represe Mathematical Morr	hology	- statistical	pattern recognition - Syntac	n – erosion	recognit	ing and	closing -home	niques in re	cognition -	CO4	
skeleton - thinning	and this	ickening. S	Classes, S Generic Functio	ns, Writing	S Class	ses, Usir	ng Inheritance	, S Classes	, Writing S		
Classes, Implemen	ting a G	Generic Fun	ction on an S Class, visualiz	ation, Simu	lation, c	ode prof	iling, Statistica	al Analysis w	ith R, data		
	Data	Visualiza	ation using R				Periods: 9			<u>.</u>	
Introduction. Type	s of Dat	ta Visualiza	tion. Statistical graphs: Scatt	er Plots. Bo	x Plots.	Scatter	Plots and Box	and Histogr	ams.		
Advanced Visualiz	zation: L	Jsing the go	pplot2 package to visualize da	ata, applyin	g theme	s from g	gthemes to re	fine and cus	tomize	CO5	
charts and graphs	, Buildin	ng data gra	phics for dynamic reporting, a	idvantages.	disadva	antages.					
Lecture Period	s: 30		Tutorial Periods: 15	Practica	al Perio	ods: -	I	otal Period	IS: 45		
	11 0 /	<u> </u>	L O "D far Data Calaraa		law Va		)				
1. WICKNam 2 ggplot2	l, H. & ( Flegan	Grolemund	1, G, "R for Data Science. s for Data Analysis (2nd Fr	OREIIIY: N dition) by	iew roi Hadlev	Wickha	s m Springer	(2016)			
3. R for Da	ta Sciel	nce, Impo	rt, Tidy, Transform, Visuali	ze and Mo	del Da	ta, (1st	Edition) by F	adely Wick	cham and	Garrett	
Grolemu	nd, O'R	Reilly (2016	6).				, <b>.</b>				
4. Geocom	putatio	n with R b	y Robin Lovelace, Jakub N	lowosad,	Jannes	Muenc	how (2019).				
5. Spatial D	vata Sc	cience with	R by Robert J. Hijmans (2	2019).							
	5-1	V )	1								

#### Reference Books

- 1. Garrett Grolemund, Hadley Wickham,"Hands-On Programming with R: Write Your Own Functions and Simulations",2018
- 2. Venables , W.N., and Ripley, "S programming", Springer, 2019.
- 3. Roger D. Peng," R Programming for Data Science ", 2016
- 4. Norman Matloff, "The Art of R Programming- A Tour of Statistical Software Design", 2018
- 5. Jd long, Paul Teetor, "R Cookbook 2e: Proven Recipes for Data Analysis, Statistics, and Graphics", O'Reilly, 2019.

#### Web References

- 1. https://www.r-project.org/about.html
- 2. https://www.tutorialspoint.com/r/index.htm
- 3. https://www.javatpoint.com/r-tutorial

\* TE – Theory Exam, LE – Lab Exam

#### **COs/POs/PSOs Mapping**

COs		Program Outcomes (POs)						Os) Program Specifi Outcomes (PSOs					
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3				
1	2	3	2	-	-	-	1	2	1				
2	3	3	3	-	1	-	2	2	1				
3	2	3	2	1	2	-	2	2	1				
4	3	3	3	1	3	-	2	2	1				
5	3	3	3	1	3	-	2	2	1				

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		Continuo	CAM)	End			
ASSESSMENT	CAT 1	CAT 2	Model Exam	Assignment	Attendance	Semester Examination (ESE) Marks	Total Marks
Marks	1	0	15	10	5	60	100

Department	Artificial Intelligence and Data Science Programme: M.Tech.								
Semester	II	Course	Catego	ory: PE	*Enc	Semeste	r Exam Typ	e: <b>TE</b>	
Course Code	P23ADE213	Perio	ds / W	eek	Credit	Ma	kimum Mark	S	
	FZJADLZ IJ	L	Т	Р	С	CAM	ESE	ТМ	
Course Name	Full Stack Development	3	-	-	3	40	60	100	
	L								
Prerequisite	Java Programming Basics	<u>.</u>	L			L	L		
•	On completion of the course, the studer	nts will be	e able	to			BT Ma	pping	
_							(Highes	t Level)	
Course	<b>CO1</b> Understand the syntax, control struct	ture, and	data st	tructure	of Java prog	ramming.	K	2	
Outcomes	CO2 Understand the database connectivit	ty to creat	e real-	life or bu	isiness solu	ions.	K	2	
	CO3 Understand the J2EE Architecture a	nd develo	p the v	veb appl	ication.		K	3	
	CO4 Use Object Relation Mapping using I	Hibernate	to buil	ld the da	tabase.		K	3	
	<b>CO5</b> Design and develop the web application	tion usina	Spring	a MVC.			K	3	
UNIT-I	Introduction to Programming Periods: 9								
Introduction to Jav	/a Programming: Basic constructs of OOPS – [	Data types	– Ope	rators an	d control stat	ements –	Classes and		
Methods – Inherita	nce and Packages					_		CO1	
Exception handling	J: Fundamental of Exceptions – Types of Exception	ons – Multi	hreade	ed prograr	nming and I/C	).			
UNIT-II	JDBC Programming				Periods: 9				
The JDBC Connec	tivity Model – Database Programming – Connectir	ng to the Da	atabase	e – Creatir	ng a SQL Que	ry – Getting	g the Results	CO2	
<ul> <li>Updating Databa</li> <li>Property Statema</li> </ul>	ise Data – Error Checking and the SQL Exception	n Class – <sup>-</sup>	The SQ	L Warnin	g Class – Th	e Statemer	nt Interface –		
Queries – Result S	Set Meta Data – Executing SQL Updates – Transa	action Man	agemer	nt.		ypes – Ex			
UNIT-III	J2EE and Web Development				Periods: 9				
J2EE Architecture	Types – J2EE Containers – Types of Servers in J2	EE Applica	ation – H	HTTP Pro	tocols and AF	'l – Reques	t Processing		
in Web Application	<ul> <li>Web Application Structure – Web Containers a</li> </ul>	and Web A	rchitect	ure Mode	ls.			CO3	
	Hibernate			ľ	Periods: 9				
Introduction to Hit	pernate – Exploring Architecture of Hibernate –	Obiect R	elation	Mapping	(ORM) with	Hibernate	<ul> <li>Hibernate</li> </ul>	CO4	
Annotation – Hiber	nate Query Language (HQL), CRUD Operation u	sing Hiberi	nate AF	и. Ч.	()			004	
	Java Wah Framouraka, Carina MVO			Ĩ	Denie des 0				
UNII-V Spring: Introductio	Java web Frameworks: Spring MVC	ife Cycle	of Boo	n Factor	Periods: 9	Constructo	r Injection		
Dependency Inject	ion – Inner Beans – Aliases in Bean – Bean Sco	pes – Sprii	ng Ann	otation –	Spring AOP I	Nodule – S	pring DAO –	CO5	
Database Transac	tion Management – CRUD Operation using DAO	and Spring	API.						
Lecture Period	s: 45 Tutorial Periods: -	Practica	al Peri	ods: -	Т	otal Perio	ods: 45		
Text Books		= .			~~~				
1. Herbert 3	Schildt, "Complete Reference Java", Mcgraw	Hill Educa	ation, <i>i</i> Advanc	(" edition	1, 2021. ures" Dears	on 8th od	ition 2008		
3. Deitel an	d Deitel, "Java How to Program". Prentice H	all. 10 <sup>th</sup> e	dition.	2016.	ules, reals	on, o eu	1001, 2000.		
Reference Book	is	,	,						
1. Herbert S	Schildt, "Java: A Beginner's Guide", Oracle F	Press, 6 <sup>th</sup>	edition	, 2014.					
2. Maydene	Fisher, Jon Ellis, Jonathan Bruce, and Addi	ison Wesl	ey, "JE	DBC", AF	PI Tutorial ar	nd Referer	nce, 3 <sup>rd</sup> editi	on, 2003.	
3. Kathy W	alrath, "Java Server Programming Black Boo	OK", J2EE,	Drear	n lech F	ublishers, 1	<sup>st</sup> edition,	2008.		
5. Craid Wa	alls. "Spring in Action". Manning Publication.	3 <sup>rd</sup> editior	n. 2011	alion, 2 <sup></sup> I.		0.			
	······································	• • • • • • • • •	.,	-					
Web References	<b>\$</b>								
6. https://do	cs.oracle.com/javase/tutorial								
8. https://w	ww.java.point.com/iava								
9. https://ar	chieve.nptel.ac.in/courses/106/105/1061051	91/							
10. https://ww	ww.geeksforgeeks.org								
* TE -	- Theory Exam, LE – Lab Exam								

5-15/-

COs		Progra	m Out	)	Program Specific Outcomes (PSOs)				
	P01	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	2	1	2	2	3	2	2
2	1	2	2	2	2	2	3	2	2
3	2	3	3	1	3	3	3	3	3
4	2	3	3	1	3	3	3	3	3
5	2	3	3	1	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Assessment		Continu	ious Asse	essment Marks(	CAM)	End Semester	Total
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance	Examination(ESE) Marks	Marks
				4.0	-		100
Marks	10		15	10	5	60	100

Department	Artific	ial Intelligence and Data Science	Programme: M.Tech.							
Semester	I/II		Course	Catego	ory : <b>AC</b>	*En	d Semester	Exam Typ	be: TE	
	D23V	CTX01	Perio	ds / W	eek	Credit	Ma	ximum Ma	ırks	
Course Coue	1 234		L	Т	Р	С	CAM	ESE	TM	
Course Name	Engli	sh for Research Paper Writing	-	-	2	-	100	-	100	
		(Commo	on to all M	.Tech I	Program	me)	<u>1</u>			
Prerequisite	No P	rerequisite needed								
	On co	ompletion of the course, the stude	nts will b	e able	to			BT Maj (Highest	pping Level)	
_	CO1	Understand that how to improve your w	iting skills a	and leve	el of read	ability.		Kź	2	
Course	CO2	Learn about what to write in each sectio	n.					<b>K</b> 1	I	
Outcomes	CO3	Understand the skills needed when writi	ng a Title.					Kź	2	
	CO4	Understand the skills needed when writi	ng the Con	clusion				Kź	2	
	CO5	Ensure the good quality of paper at very	first-time s	ubmiss	ion.			K	3	
UNIT- I	Introd	uction to Research Paper Writing				Periods:	6			
Planning and Prep Removing Redund	paration dancy, A	, Word Order, Breaking up long sentence Avoiding Ambiguity and Vagueness.	es, Structur	ing Para	agraphs a	and Senten	ces, Being C	oncise and	CO1	
UNIT- II	Prese	entation Skills				Periods:	6			
Clarifying Who Die Abstracts, Introdu	d What, ction.	Highlighting Your Findings, Hedging and	I Criticizing	, Parapl	nrasing a	nd Plagiaris	m, Sections	of a Paper,	CO2	
UNIT- III	Title	Writing Skills				Periods:	6			
Key skills are nee Introduction, skills	ded whe	en writing a Title, key skills are needed w d when writing a Review of the Literature	hen writing , Methods,	an Abs Results	tract, key , Discuss	/ skills are r sion, Conclu	eeded when sions, The F	writing an inal Check.	CO3	
UNIT- IV	Resu	It Writing Skills				Periods:	6			
Skills are needed Discussion, skills	when w are nee	riting the Methods, skills needed when w ded when writing the Conclusions.	riting the R	esults,	skills are	needed wh	en writing the	9	CO4	
UNIT- V	Verifi	cation Skills				Periods:	6			
Useful phrases, cl	hecking	Plagiarism, how to ensure paper is as go	ood as it co	uld pos	sibly be t	he first- tim	e submission	•	CO5	
Lecture Period	ds: 30	Tutorial Periods: -	Practica	al Perio	ods: -		Total Perio	ods: 30		
Reference Boo	ks									
<ol> <li>Adrian Wallwor</li> <li>Day R, "How to</li> <li>Goldbort R, "Wallwort R, "Wallwort R, "Handbort R, "H</li></ol>	k, "Engl Write a riting for andbool	ISh for Writing Research Papers", Spring nd Publish a Scientific Paper", Cambridg Science", Yale University Press (Availat of Writing for the Mathematical Science	er, New Yo le Universit ble on Goo s", SIAM. F	rk, Dorc y Press gle Bool lighmar	irecht He , 2006. ks), 2006 ì's book.	eidelberg Lo 5. 1998.	ndon, 2011.			

Assessment	Continuous Assessment Marks (CAM) Exam (ESE)						Total Marks
	Assignment 1	Assignment 2	Test 1	Test 2	Attendance		
Marks	20	20	25	25	10	-	100

Department	Artifici	ial Intelli	gence and Data Science	Programme: <b>M.Tech.</b>								
Semester	I/II			Course	Catego	ory : <b>AC</b>	*End	d Semester	<sup>r</sup> Exam Typ	be: TE		
Course Code	D33V	СТУЛЗ		Perio	ds / W	eek	Credit	Ma	ximum Ma	rks		
	1 234			L	Т	Р	С	CAM	ESE	TM		
Course Name	Disas	ster Mana	agement	-	-	2	-	100	-	100		
	.1		(Commo	on to all M	Tech I	Program	nme)	i				
Prerequisite	No Pr	erequisite	e needed									
	On co	ompletio	n of the course, the stude	nts will be	e able	to			BT Map (Highest	oping Level)		
_	CO1	Ability to a	summarize basics of disaster.						K1	l		
Course Outcomes	CO2	Ability to o humanita	explain a critical understanding rian response.	of key con	cepts ir	n disaste	r risk reducti	on and	K2	2		
	CO3	Ability to i from mult	Ilustrate disaster risk reduction iple perspectives.	and huma	nitarian	respons	e policy and	practice	K3	\$		
	CO4	Ability to or relevance	describe an understanding of s in specific types of disasters a	tandards of and conflict	f humar situatio	nitarian ro ns.	esponse and	practical	K3	\$		
	<b>CO5</b> Ability to develop the strengths and weaknesses of disaster management approaches. <b>K3</b>											
UNIT- I	UNIT-I Introduction Periods: 6											
Disaster: Definitio Difference, Nature	n, Facto e, Types	ors and Sig and Magr	nificance; Difference between nitude.	Hazard An	d Disas	ter; Natu	iral and Man	made Disas	ters:	CO1		
UNIT- II	Repe	rcussion	s of Disasters and Hazard	ls			Periods:	6				
Economic Damag Cyclones, Tsunan Industrial Acciden	ge, Loss nis, Floo its, Oil S	of Huma ds, Droug licks and S	n and Animal Life, Destructior hts and Famines, Landslides ar Spills, Outbreaks Of Disease A	n of Ecosy: nd Avalancl nd Epidem	stem. N hes, Ma ics, Wa	Natural D In-made r And Co	isasters: Ea disaster: Nu onflicts.	rthquakes, V clear Reacto	Volcanisms, or Meltdown	, CO2		
UNIT- III	Disas	ster Pron	e Areas in India				Periods:	6				
Study of Seismic 2 Hazards with Spe	Zones; A cial Refe	Areas Pron erence To	e To Floods and Droughts, Lar Tsunami; Post-Disaster Diseas	ndslides An ses and Ep	d Avala idemics	inches; A 8.	reas Prone	Fo Cyclonic	and Coasta	CO3		
UNIT- IV	Disas	ster Prep	aredness and Managemer	nt			Periods:	6				
Preparedness: Mo Data from Meteor	onitoring ological	of Pheno And Other	omena Triggering a Disaster o r Agencies, Media Reports: Go	or Hazard; vernmenta	Evaluat	ion of Ri ommunit	isk: Applicati y Preparedn	on of Remo ess.	ote Sensing,	<b>CO4</b>		
UNIT- V	Risk	Assessm	nent				Periods:	6				
Disaster Risk: Co Assessment, Glol Survival	ncept ar bal Co-C	nd Elemen Operation	ts, Disaster Risk Reduction, G in Risk Assessment and Warn	lobal and N hing, People	National e's Part	l Disaste ticipation	r Risk Situat in Risk Ass	ion. Technic essment. St	ues of Risk trategies for	CO5		
Lecture Perio	ds: 30		Tutorial Periods: -	Practica	al Perio	ods: -		Total Perio	ods: 30			
Reference Boo	ks					~ -						
1. Goel S. L., "Dis 2. NishithaRai, Siı 3. Sahni, Pardeep	aster Ac ngh AK, o Et.Al. ,	iministratio "Disaster "Disaster	on And Management Text And Management in India: Perspec Mitigation Experiences And Re	Case Stud tives, issue flections",	ies", De s and s Prentice	ep & De strategies e Hall Of	ep Publicatio s", New Roya India, New [	on Pvt. Ltd., al book Com Delhi, 2001.	New Delhi, pany, 2007.	2009.		

	Conti	nuous Assess	ment N	larks (	CAM)	End	
Assessment	Assignment Assignment 2		Test 1	Test 2	Attendance	Semester Examination (ESE) Marks	Total Marks
Marks	20	20	25	25	10	-	100



Department	Artific	ial Intelli	gence and Data Science	Programme: M.Tech.							
Semester	I/II			Course	Catego	ory : <b>AC</b>	*E	nd Semester	r Exam Ty	pe: <b>TE</b>	
	D23V	СТХОЗ		Peric	ds / W	eek	Cred	it Ma	ximum Ma	arks	
Course Coue	1 237			L	Т	Р	С	CAM	ESE	TM	
Course Name	Sans	krit for T	ecnical Knowledge	-	-	2	-	100	-	100	
			(Commo	on to all M	.Tech F	Program	me)				
Prerequisite	No Pi	rerequisit	e needed								
	On co	ompletio	n of the course, the stude	nts will b	e able	to			BT Mapping (Highest Leve		
~	CO1	Understa	nding basic Sanskrit language.						K	2	
Course	CO2	Write ser	itences						K	2	
Catoonioo	CO3	Know the	order and roots of Sanskrit.						K	K3	
	CO4	Know abo	out technical information about	Sanskrit lit	erature				K	3	
	CO5	CO5 Understand the technical concepts of Engineering.									
UNIT- I	Alph	abets					Periods	: 6			
Alphabets in Sans	skrit.									CO1	
UNIT- II	Tens	es and S	entences				Periods	: 6			
Past/Present/Futu	ire Tens	e - Simple	e Sentences.							CO2	
UNIT- III	Orde	r and Ro	ots				Periods	5:6			
Order - Introductio	on of roo	ots of Engi	neering-Electrical, Mechanical,	, Architectu	re, Math	nematics.				_	
	0	I	-1			I	Deriede			CO3	
UNIT-IV	Sans	Krit Liter	ature				Perioas	5:0		001	
										C04	
UNIT- V	Tech	nical Co	ncepts of Engineering				Periods	: 6			
Technical concept	ts									CO5	
Lecture Period	ds: 30		Tutorial Periods: -	Practica	al Perio	ods: -		Total Perio	ods: 30		
Reference Boo	ks		•••••••••••••••••••••••••••••••••••••••								
1. Dr. Vishwas, "A 2. Prathama Deek	bhyasp sha, Ve	ustakam", empati Kut	Samskrita-Bharti Publication, I umbshastri, Rashtriya Sanskrit	New Delhi. Sansthana	am, "Tea	ach Yours	self Sansk	rit", New Delh	i Publicatio	n.	

3. Suresh Soni, "India's Glorious Scientific Tradition", Ocean books (P) Ltd., New Delhi, 2017

	Conti	nuous Assess	ment N	larks (	CAM)	End	
Assessment	Assignment Assignment Test Test Attendance		Semester Examination (ESE) Marks	Total Marks			
Marks	20	20	25	25	10	-	100

Department	Artific	al Intelligence and Data Science	Program	nme: <b>M</b>	.Tech.				
Semester	I/II		Course	Catego	ory : AC	*End S	Semester Ex	am Type:	TE
Course Code	D23V	стхи	Perio	ds / We	eek	Credit	Ma	ximum Ma	rks
	1 237		L	Т	Р	С	CAM	ESE	TM
Course Name	Value	Education	-	-	2	-	100	-	100
	1	(Commo	on to all M	Tech F	Program	me)	I	1	
Prerequisite	No Pi	erequisite needed							
	On co	ompletion of the course, the stude	nts will be	e able	to			BT Ma (Highest	oping Level)
_	CO1	Knowledge of self-development.						Kź	2
Course	CO2	Learn the importance of Human values.						<b>K</b> 1	
Outcomes	CO3	Developing the overall personality.						K	3
	CO4	Developing Character and Competence						K	}
UNIT- I	Value	es and Self Development				Periods:	6		
Values and self-de moral valuation. S control. Honesty,	evelopm standard Studying	ent–Social values and individual attitude s and principles. Value judgments of Wo g effectively.	s. Work eth men. All re	nics, Ind ligions a	lian visior and same	n of humani message.	sm. Moral an Mind your M	id non- ind, Self-	CO1
UNIT- II	Cultiv	vation of Values				Periods:	6		
Importance of cult Honesty, Humanit	ivation o y. Powe	of values. Sense of duty. Devotion, Self-ro- er of faith, National Unity. Patriotism. Love	eliance. Co e for nature	nfidenc , Discip	e, Conce line	ntration. Tr	uthfulness, C	leanliness.	CO2
UNIT- III	Perso	onality Development				Periods:	6		
Personality and B and Kindness. Ave friendship. Happir saving nature.	ehavior oid fault ness Vs	Development-Soul and Scientific attitude Thinking. Free from anger, Dignity of lab suffering, love for truth. Aware of self-des	e. Positive 1 our. Univer structive ha	Thinking rsal brot bits. As	. Integrity her hood sociation	and discip and religio and Coope	line. Punctua ous tolerance. eration. Doing	ality, Love True g best for	CO3
UNIT- IV	Chara	acter Development				Periods:	6		
Character and Co Nonviolence, Hum	mpeten nility, Ro	ce–Holy books vs Blind faith. Self-manag le.	ement and	Good h	nealth. Sc	ience of re	incarnation.	Equality,	CO4
Lecture Period	ds: 30	Tutorial Periods: -	Practica	al Perio	ods: -		<b>Total Peric</b>	ods: 30	-
Reference Boo	ks								
1. Chakroborty, S	.K. "Valı	ues and Ethics for organizations Theory a	and practice	e", Oxfo	rd Univer	sity Press,	New Delhi.		

	Conti	nuous Assess	ment N	larks (	CAM)	End	
Assessment	Assignment 1	Assignment Assignment Test Test Attendance		Semester Examination (ESE) Marks	Total Marks		
Marks	20	20	25	25	10	-	100

Department	Artificial Intelligence and Data Science	Program	nme: <b>M</b> .	Tech.				
Semester	1/11	Course	Catego	ry : <b>AC</b>	*End Se	emester Exa	m Type: •	ΓЕ
Course Code	D22ACTV05	Perio	ds / We	ek	Credit	Ma	ximum Ma	ırks
Course Code	F23AC1705	L	Т	Р	С	CAM	ESE	TM
Course Name	Constitution of India	-	-	2	-	100	-	100
	(Commo	on to all M	.Tech P	rogram	me)	L	L	
Prerequisite	No Prerequisite needed							
	On completion of the course, the stude	ents will b	e able t	:0			BT Ma (Highest	pping : Level)
Course	<b>CO1</b> Discuss the growth of the demand for ciarrival of Gandhi in Indian politics.	ivil rights in	India for	the bulk	of Indians	before the	K	3
Outcomes	CO2 Discuss the intellectual origins of the fra conceptualization of social reforms lead	amework of ing to revol	argumei ution in l	nt that in India.	formed the		K	3
	CO3 Discuss the circumstances surrounding [CSP] under the leadership of Jawaharl direct elections.	the founda al Nehru an	tion of th d the ev	e Congr entual fa	ess Sociali ailure of the	st Party proposal of	K	3
	CO4 Discuss the passage of the Hindu Code	Bill of 1956	6.				K	3
	CO5 Discuss the administration and Election		K3					
UNIT- I	History of Making of The Indian Constitu	ution			Periods:	6		
History, Drafting C	Committee, (Composition & Working).							CO1
UNIT- II	Philosophy of The Indian Constitution				Periods:	6		
Preamble, Salient	Features.							CO2
UNIT- III	Contours of Constitutional Rights and	Duties			Periods:	6		
Fundamental Righ Educational Right	nts, Right to Equality, Right to Freedom, Right ag s, Right to Constitutional Remedies, Directive Pr	painst Explo rinciples of \$	itation, I State Po	Right to I licy, Fun	Freedom of damental E	Religion, Cu Duties.	ltural and	CO3
UNIT- IV	Organs of Governance				Periods:	6		
Parliament, Comp Ministers, Judicia	osition, Qualifications and Disqualifications, Pov y, Appointment and Transfer of Judges, Qualific	vers and Fu ations, Pow	nctions, /ers and	Executive Function	ve, Preside ns.	nt, Governor,	Council of	CO4
UNIT- V	Local Administration and Election Com	nmission			Periods:	6		
District's Administ Municipal Corpora and role. Block le Importance of gra Commissioners -	ration head: Role and Importance, Municipalities ition. Pachayati raj: Introduction, PRI: Zila Pacha evel: Organizational Hierarchy (Different depart ass root democracy. Election Commission: Rol Institute and Bodies for the welfare of SC/ST/OB	s: Introducti yat. Elected ments), Vill e and Fund SC and wom	on, Mayo officials age leve ctioning. nen.	or and ro and thei el: Role Chief E	ole of Electe r roles, CEC of Elected lection Cor	ed Represent O Zila Pachay and Appoint nmissioner a	ative, CEC vat: Position ed officials nd Election	, , , ,
Lecture Perio	ds: 30 Tutorial Periods: -	Practica	al Perio	ods: -		<b>Total Peric</b>	ods: 30	
Reference Boo	ks							
1. "The Constitution 2. Dr.S.N.Busi, Dr 3. M.P. Jain, India 4. D.D. Basu, Intro 5. Suresh Soni, "International Contention of the content of t	on of India, 1950(Bare Act), Government Publica .B. R.Ambedkar framing of Indian Constitution, n Constitution Law, 7th Edition, Lexis Nexis, 20 oduction to the Constitution of India, Lexis Nexis ndia's Glorious Scientific Tradition" Ocean books	ntion. 1 st Edition, 14. , 2015. s (P) Ltd., N	2015. ew Delh	i, 2017.				

Assessm	Con	tinuous Asses	AM)	End Semester Examination (ESE) Marks	Total Marks		
ent	Assignment 1	Assignmen t 2	Test 1	Test 2	Attendance		
Marks	20	20	25	25	10	-	100

Department	Department Artificial Intelligence and Data Science					Programme: M.Tech.							
Semester	I/II			Course	Catego	ory : AC	*End Ser	nester Exa	m Type: <sup>-</sup>	ГЕ			
Course Code	D33V	CTYDE		Peric	ods / W	eek	Credit	Мах	imum Ma	arks			
	1 237			L	Т	Р	С	CAM	ESE	ТМ			
Course Name	Peda	igogy Stu	dies	-	-	2	-	100	-	100			
	1		(Commo	on to all M	.Tech F	Program	ime)	l					
Prerequisite	No Pi	rerequisite	needed										
	On co	ompletior	of the course, the stude	nts will b	e able	to			BT Ma (Highest	pping t Level)			
Course	C01	What peda developin	agogical practices are being u g countries?	sed by tead	chers inf	formal ar	nd informal cl	assrooms in	K2				
Outcomes	CO2	What is th conditions	e evidence on the effectivene , and with what population of	ss of these learners?	pedago	gical pra	ictices, in what	at	K	2			
	CO3	How can t guidance	eacher education (curriculum naterials best support effectiv	and practic	cum) and v?	d the sch	ool curriculur	n and	K	2			
	CO4	Illustrate F	Professional development						K	3			
CO5 Identify Research gaps and Future Directions									K	3			
UNIT- I Introduction and Methodology								Periods: 6					
Aims and rationale education - Conce	e, Policy eptual fra	y backgrou amework, I	nd, Conceptual framework and Research questions – Overvie	d terminolo w of metho	gy - The dology a	eories of and Sea	learning, Cur rching.	riculum, Tea	cher	CO1			
UNIT- II	Them	natic Ove	view				Periods: 6	6					
Pedagogical pract Teacher education	tices are n.	e being use	d by teachers in formal and in	formal clas	srooms	in devel	oping countri	es - Curricul	um,	CO2			
UNIT- III	Evide	ence on T	he Effectiveness of Peda	gogical F	Practice	es	Periods: 6	3					
Methodology for the practicum) and the and nature of the Teachers' attitude	he in de e schoo body of s and b	pth stage: I curriculun evidence f eliefs and I	quality assessment of included and guidance materials best or effective pedagogical practi Pedagogic strategies	d studies - support efi ces - Peda	How car fective p lgogic th	n teache edagogy eory and	r education (o /? - Theory o d pedagogica	curriculum ai f change - S l approaches	nd trength 8 -	CO3			
UNIT- IV	Profe	essional D	evelopment				Periods: 6	5		<u>.</u>			
Professional deve teacher and the co	lopmen ommuni	it: alignmen ity - Curricu	t with classroom practices and lum and assessment - Barrier	d follows up s to learnir	o suppor ng: limite	rt – Peer ed resour	support - Su ces and large	pport from the class sizes	ne head	CO4			
UNIT- V	Rese	arch Gap	s and Future Directions				Periods: 6	3					
Research design - impact.	- Conte	exts – Peda	gogy - Teacher education - Co	urriculum a	nd asse	ssment -	Disseminatio	on and resea	arch	CO5			
Lecture Period	ds: 30		Tutorial Periods: -	Practic	al Perio	ods: -	٦	Total Perio	ds: 30				
Reference Boo	ks												
<ol> <li>Ackers J, Hardr</li> <li>Agrawal M, "Cu</li> <li>Akyeampong K</li> <li>London, DFID</li> <li>Akyeampong K</li> <li>preparation co</li> </ol>	man,F, " ırricular , "Teacł , 2003. , Lussie unt?", Ir	"Classroom reform in s her training er K, Pryor v nternationa	interaction in Kenyan primary chools: The importance of eva in Ghana-does it count? Mult I, Westbrook J, "Improving tea Journal Educational Develop	v schools, ( aluation, Jo i-site teach aching and ment, 33(3	Compare ournal of er educa learning b): 272–2	e", 31(2): Curriculation res of basic 282, 201	245-261,20 um Studies", earch project maths and r 3.	001. 36(3):361-3 (MUSTER) eading in Afr	79, 2004. country re rica: Does	port", teacher			

Alexander RJ, "Culture and pedagogy: International comparisons in primary education", Oxford and Boston: Blackwell, 2001.
 Chavan M, "Read India: Amass scale, rapid, 'learning to read' campaign", 2003.
 www.pratham.org/images/resource%20working%20paper%202.pdf.

	Conti	nuous Assess	ment N	larks (0	CAM)	End	
Assessment	Assignment 1	Assignment 2	Test 1	Test 2	Attendance	Semester Examination (ESE) Marks	Total Marks
Marks	20	20	25	25	10	-	100

5. AS .-

Department	Artific	ial Intelli	gence and Data Science	Progran	nme: <b>M</b>	.Tech.					
Semester	I/II			Course	Catego	ory : <b>AC</b>	*End S	emester Exa	am Type: T	ΓE	
	D23V	CTX07		Peric	ods / W	eek	Credi	t Ma	ximum Ma	ırks	
	1 237			L	Т	Р	С	CAM	ESE	TM	
Course Name	Stres	s Manag	ement by Yoga	-	-	2	-	100	-	100	
	4		(Commo	on to all M	.Tech F	Program	me)				
Prerequisite	No P	rerequisit	e needed								
	On c	ompletio	n of the course, the stude	nts will b	e able	to			BT Ma (Highest	pping Level)	
~	CO1	Develop I	nealthy mind in a healthy body	thus impro	ving soo	cial health	n also		K	2	
Course	CO2	Improve e	efficiency.						K	2	
Catcomod	CO3	Understa	nd Asan and Pranayam						K	2	
	CO4	Apply Asa	anas						K	4	
	CO5	CO5 Apply Pranayam									
UNIT- I	Intro	duction					Periods	: 6			
Definitions of Eigh	t parts	of yoga. (A	shtanga).							CO1	
UNIT- II	Do`s	and Don	't's in Life				Periods	: 6			
Yam and Niyam	- Do`s a	and Don't's	s in life - i) Ahinsa, satya, asthe	ya, bramha	acharya	and apa	rigraha, ii)	Ahinsa, satya	, astheya,	CO2	
bramhacharya a	nd apar	igraha.									
UNIT- III	Asan	and Pra	nayam				Periods	: 6			
Asan and Pranay effects-Types of p	am - Va ranayar	arious yoga m.	a poses and their benefits for	mind & bo	dy - Re	gularizati	on of brea	thing techniqu	ues and its	CO3	
UNIT- IV	Asan	Practice	S				Periods	: 6			
Practice on Variou	is yoga	poses								CO4	
UNIT- V	Prana	ayam Pra	actices				Periods	: 6			
Practice on variou	is prana	iyam								CO5	
Lecture Period	ds: 30		Tutorial Periods: -	Practic	al Perio	ods: -		Total Perio	ods: 30		
Reference Boo	ks										
1. Janardan Swan	ni Yoga	bhyasi Ma	andal, "Yogic Asanas for Group	Tarining-I	Part-I", N	Vagpur.					
2. Swami Vivekan	anda, "I	Rajayoga	or conquering the Internal Natu	ire", Advait	a Ashra	ma Publi	cation Dep	artment, Kolk	ata		

	Conti	nuous Assess	ment N	larks (	CAM)	End	
Assessment	Assignment Assignme		Test 1	Test 2	Attendance	Semester Examination (ESE) Marks	Total Marks
Marks	20	20	25	25	10	-	100

Department Artificial Intelligence and Data Science					e F	Programme: M.Tech.							
Semester	1/11				C	Course Category : AC				*End Semester Exam Type: <b>TE</b>			
Course Code					Perio	ds / We	eek	Cred	Credit Maximum Mar		arks		
					L	Т	Р	С	CAM	ESE	TM		
Course Name Personality Development through Life Enlightenment Skills					ife	-	-	2	-	100	-	100	
(Common to all M.Tech Programme)													
Prerequisite No Prerequisite needed													
	On completion of the course, the students will be able to										BT Ma (Highest	BT Mapping (Highest Level)	
Course Outcomes	CO1	1 Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.								K	K3		
	CO2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity.									K	K1	
	CO3	<b>CO3</b> Study of Neet is hatakam will help in developing versatile personality of students.									K	K3	
UNIT- I	Periods: 6												
Neetisatakam-holistic development of personality - Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue) - Verses- 52,53,59 (dont's) - Verses- 71,73,75,78 (do's) 4-Verses 18, 38,39 Chapter18 – Verses37,38,63.													
UNIT- II	Periods: 12												
Approach to day t 35 Chapter 6-Vers Chapter 3-Verses	to day w ses 5,13 36,37,4	ork and du 3,17,23, 35 2 – Chapt	uties - Shrin 5 - Chapter ter.	nad Bhagwad Ge 18-Verses 45, 46	eta: C , 48.n	Chapter : nodel – :	2-Verse shrimad	s 41, 47 bhagwa	,48 - Chap ad geeta - (	ter 3- Verses Chapter2- Ve	13, 21, 27, rses 17,	CO2	
UNIT- III	Periods: 12												
Statements of basic knowledge – Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter12 -Verses 13, 14, 15, 16,17, 18 - Personality of role.													
Lecture Periods: 30			Tutorial	Periods: -	F	Practical Periods: -				Total Periods: 30			
Reference Books													
1. Gopinath, Rash 2. Swami Swarup	ntriya Sa ananda,	inskrit Sar Srimad B	isthanam P hagavad G	, "Bhartrihari's Th ita, Advaita Ashra	iree S am, P	atakam ublicatio	, Niti-sri n Depa	ngar- vai rtment, k	iragya", Ne (olkata, 20	ew Delhi,2010 16	).		

Assessment	Conti	End										
	Assignment 1	Assignment 2	Test 1	Test 2	Attendance	Semester Examination (ESE) Marks	Total Marks					
Marks	20	20	25	25	10	-	100					
Department Artificial Intelligence and Data Science				Programme: M.Tech.								
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Semester	I/II			Course Category : AC *En				d Semester Exam Type: <b>TE</b>				
Course Code	P23ACTX09			Perio	ds / W	eek	Credit	Credit Maximum Marks				
Course Coue				L	Т	Р	С	CAM	ESE	ТМ		
Course Name	Unna	t Bharat	h Abhiyan	-	-	2	-	100	-	100		
	±		(Commo	on to all M	Tech I	Program	ime)		<u>t</u>			
Prerequisite	No Prerequisite needed											
Course Outcomes	On completion of the course, the students will be able to									BT Mapping (Highest Level)		
	CO1 Gain an understanding of rural life, culture and social realities							K3		3		
	CO2 Develop a sense of empathy and bonds of mutuality with local com						nunity J			1		
	CO3	33 Appreciate significant contributions of local communities to Indian						economy	K	K3		
	CO4	Learn to value the local knowledge and wisdom of the community						К		3		
	CO5 Identify opportunities for contributing to community's socio-econom						ic improven	nents.	K3			
UNIT- I	Appre	ciation o	f Rural Society				Periods:	6				
Rural life style, rui elaboration of "sou	ral socie ul of Indi	ety, caste a ia lies in v	and gender relations, rural valu illages' (Gandhi), rural infrastru	ies with res icture.	pect to	commun	ity, nature a	nd resource	S,	C01		
UNIT- II	Understanding Rural Economy and Livelihood Periods: 6											
Agriculture, farm entrepreneurs, rur	ing, lar al mark	ndownersh ets.	nip, water management, an	imal husba	andry,	non-farn	n livelihood	s and artis	ans, rural	CO2		
UNIT- III	Rural Institutions Periods: 6											
Traditional rural Committees), loca	organiza I civil sc	ations, So ciety, loca	elf-help Groups, Panchayati al administration.	raj institut	ions (G	Bram Sa	abha, Gram	Panchayat	, Standing	CO3		
UNIT- IV	Rural Development Programmes				Periods: 6							
History of rural dev Bharat, Swatchh E	velopme 3harat, F	ent in India PM Awaas	, current national programmes: S Yojana, Skill India, Gram Pan	Sarva Shik chayat Dec	sha Abl centraliz	hiyan, Be ed Planı	eti Bachao, E ning, NRLM	Beti Padhao, MNREGA,	Ayushman etc.	CO4		
UNIT- V	Field Based Practical Activities         Periods: 6											
Visit MGNREGS p with local leaders resources and gap analysis.	oroject s , Panch os, Parti	ites. Swac nayat func icipate in (	chh Bharat project sites, Condu tionaries, Visit Rural Schools Gram Sabha meetings, Visit Io	ict Mission / / mid-day cal Anganw	Antyoda meal c adi Cer	aya surve entres, s ntre, Cor	eys, Interact study Acade iduct soil he	ive communi emic and infr alth test, drir	ty exercise rastructural hking water	CO5		
Lecture Periods: 30 Tutorial Periods: -				Practica	Practical Periods: -				Total Periods: 30			
Reference Boo	ks											
<ol> <li>Singh, Katar, "F</li> <li>A Hand book of</li> <li>United Nations,</li> <li>M.P.Boraian, "E</li> </ol>	Rural De n Village "Sustai Best Pra	evelopmen e Panchay nable Dev ctices in F	t : Principles, Policies and Mar at Administration, Rajiv Gandh relopment Goals", 2015. Rural Development", Shanlax P	nagement", ii Chair for I Publishers, 2	Sage P Pancha <u>y</u> 2016	Publicatio yati Raj \$	ns, New De Studies, 200	lhi, 2015. 02.				

## **Evaluation Method**

	Conti	End					
Assessment	Assignment 1	Assignment 2	Test 1	Test 2	Attendance	Semester Examination (ESE) Marks	Total Marks
Marks	20	20	25	25	10	-	100